PACIFIC MARINE SCIENCE REPORT 72-1

OCEANOGRAPHIC OBSERVATIONS AT OCEAN STATION P (50° N, 145° W)
VOLUME 51
May 14 - August 12, 1971

P. Vandergugten and B.G. Minkley

ENVIRONMENT CANADA
Water Management Service
Marine Sciences Branch
Pacific Region
1230 Government St.
Victoria, B.C.

MARINE SCIENCES BRANCH, PACIFIC REGION

PACIFIC MARINE SCIENCES REPORT NO. 72-1

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by

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Marine Sciences Branch, Pacific Region
Environment Canada
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PACIFIC MARINE SCIENCE REPORT SERIES

ERRATA

TO

REPORT NO. 71-5

Page 4: Under headings for the data listing, etc., change:
TEMP is temperature (Decibars Celsius) to read:
TEMP is temperature (Degrees Celsius).

All pages of STD listings without profiles - Lower columns only - Change PRESS heading to read DEPTH.

REPORT NO. 71-6

Pages 122, 123: STD listings - Lower columns only - Change PRESS heading to read DEPTH.

REPORT NO. 71-7

Page 3: Other Observations, etc., subsection 111 - Change heading Marine Geophysics to read Marine Geochemical.

Page 5: Under headings for the Data Listings, etc., change:
TEMP is temperature (decibars Celsius) to read:
TEMP is temperature (degrees Celsius).

Pages 54, 55: STD listings - Lower columns only - Change PRESS heading to read DEPTH.

REPORT NO. 71-8

Page 6: Under heading for the data listings, etc., change:
TEMP is temperature (decibars Celsius) to read:
TEMP is temperature (degrees Celsius).

Pages 54, 58, 66, 70, 76: STD profiles - Apparent Salinity Inversions should be ignored as they were generated numerically by applying a discontinuous salinity correction - See Fig. 2, Page 10.

REPORT NO. 71-9

Page 8: Under heading for the Data Listings, etc., change:
TEMP is temperature (Decibars Celsius) to:
TEMP is temperature (Degrees Celsius).

First sentence under Summary of Hydrographic Data - for "graphical" read "graphically".

Pages 42, 43, 98, 99, 158, 159, 196, 250, 251: STD Listings - Lower columns only - Change press heading to read DEPTH.

INTRODUCTION

Canadian operation of Ocean Weather Station P (latitude 50°00'N, longitude 145°00'W) was inaugurated in December, 1950. The station is manned by two vessels operated by the Marine Services Branch of the Ministry of Transport. They are the CCGS VANCOUVER and the CCGS QUADRA. Each ship remains on station for a period of six weeks, and is then relieved by the alternative ship, thus maintaining a continuous watch. The chief purpose of the station is to operate as a meteorological station for surface and upper-air observations and as an air-sea rescue station.

Bathythermograph observations have been made at Station P since July, 1952. A program of more extensive oceanographic observations was commenced in August, 1956. This was further extended in April, 1959, by the addition of a series of oceanographic stations along the route to and from Station P and Swiftsure Bank. These stations are known as Line P stations. The number of stations on Line P has been increased twice and now consists of twelve stations (Fig. 1). Bathythermograph observations and surface salinity sample collections in addition to being made on Line P oceanographic stations are also made at odd meridians at 40' i.e. 139°40'W, 141°40'W, etc. Data observed prior to 1968 has been indexed by Collins et al, (1969).

The present record includes hydrographic and salinity-temperature-pressure data collected from the QUADRA during the period 14 May to 30 June 1971 and the VANCOUVER during the period 25 June to 12 August 1971. Mechanical and expendable bathythermograph traces obtained on these cruises are available on IBM microfiche cards and will be available in digitized format on magnetic tape in the near future.

All physical data has been archieved by the Canadian Oceanographic Data Centre (CODC), 615 Booth Street, Ottawa, Ontario, Canada. Requests for these data should be directed to CODC.

Biological and productivity data are published in the Manuscript Report series of the Fisheries Research Board of Canada (FRB), The Biological Station, Nanaimo, B.C., Canada. Requests for these data should be directed to FRB.

Marine Geochemical data are for the Ocean Chemistry Group, Marine Sciences Branch, Department of the Environment, the Biological Station, Nanaimo, B.C., Canada.

Bird observations are sent to Dr. M. Myres, University of Calgary, Calgary, Alberta, Canada; and Marine Mammal observations to Mr. I. McAskie, Fisheries Research Board of Canada, The Biological Station, Nanaimo, B.C. Canada.

Program of observations from CCGS QUADRA, 14 May to 30 June, 1971 (P-71-4) (CODC Ref. No. 02-71-004)

Oceanographic observations were made by Mr. P. Vandergugten, Marine Sciences Branch, Department of the Environment.

Dr. C. G. Gruchy and Mr. R. Bowen of the National Museum of Natural Sciences, Ottawa, Canada carried out a program of fish and plankton studies on this cruise for the museum.

En route to Station P Line P oceanographic Stations 1 through 4 were occupied and STD casts made to near bottom or 1500 meters. Due to bad weather between Stations 4 and 10 inclusive only XBT casts were made at Oceanographic and BT Stations. Station observations between 10 and 12 were cancelled.

I) Physical Oceanography.

On Station P profiles of salinity, temperature and oxygen were obtained as follows:

1) Weekly Nansen bottle casts to near bottom (4200 meters).

2) Weekly STD casts to 1500 meters immediately after the bottle cast.

3) Twice weekly STD casts to 300 meters.

4) Mechanical BT casts 8 times daily.

5) Bucket surface salinity sample daily at 0000 hrs GMT.

Other observations made and data obtained at Station P were as follows:

II) Biological and Productivity.

These data were collected as follows:

1) Plankton.
A total of 33 - 50m, 30 - 150 meter and 2 - 1200m vertical hauls, seven 10 minute horizontal tows. Daily micro-organism samples from the seawater loop.

2) Van Dorn bottle casts to 200 meters for pigment, nitrate and C-14 productivity. 1 cast to 38 meters simultaneously with University of Washington vessel R. V. Thomas G. Thompson.

3) Surface nitrate samples at all stations on Line P outbound and inbound.

4) Weekly secchi disk depth measurements.

III) Marine Geochemistry.

Samples for Marine Geochemical studies were taken as follows:

1) Oxygen -once weekly at standard depths from the hydrographic cast.

2) Nutrient samples for silicate, nitrate and phosphate daily from the ship's seawater loop as well as from one hydrographic cast. Hourly samples from seawater loop for one 48 hour period.

3) Alkalinity samples once every three days from the seawater loop.

4) Two seawater C_{14} samples from the seawater loop.

5) Weekly air samples for CO_2 analysis.

IV) Marine Mammal, Bird and Data Gathered for Other Institutes.

1) Marine mammal and bird observations were recorded.

2) A program of fish and plankton data collection was carried out by Dr. C. G. Gruchy for the National Museum of Natural Sciences, Ottawa, Canada.

En route from Station P oceanographic Stations 12 to 5 were occuppied. STD casts to 1500 meters were made at Stations 12, 9, 8, 6 and 5 and to 300 meters at Stations 11, 10 and 7. Oceanographic Stations 4 to 1 were cancelled due to cable breakage. Standard BT casts and surface samples were taken at all Line P oceanographic and BT stations.

Program of observations from CCGS QUADRA, June 25 to August 12 ,1971 (P-71-5) (CODC Ref. No. 02-71-005)

Oceanographic observations were made by Mr. B. Minkley of the Marine Sciences Branch, Department of the Environment.

En route to Station P oceanographic Stations 1 to 3 and 8 to 12 were occupied and a STD cast to near bottom or 1500 meters was made. STD casts were not made at Stations 4 to 7 due to a breakage of the STD bridle. Standard BT or XBT casts were made and surface salinity, nutrient and nitrate samples taken at all Line P oceanographic and BT Stations.

I) Physical Oceanography.

On Station P profiles of salinity, temperature and oxygen were obtained as follows:

1) Weekly bottle casts to near bottom (4200 meters).

2) Weekly STD casts to 1500 meters with each bottle cast.

3) STD casts to 375 meters twice weekly.

4) Mechanical BT casts to 275 meters were made eight times daily.

5) A bucket sea surface salinity was collected daily at 0000 hours GMT.

Other observations made and data obtained at Station P were as follows:

II) Biological and Productivity.

These data were collected as follows:

1) Plankton
   a) Vertical hauls: daily from 50 and 150 meters and twice during the patrol from 1200 meters.
   b) Horizontal tows: Ten 10 minute tows during the patrol.
   c) Daily micro-organism samples from the ships seawater loop.
   d) Five 150 meter plankton hauls for nutrient analysis.

2) Three Van Dorn bottle casts to 50 meters and a surface sample every other week for plant pigment, nitrate and C_{14} productivity.
   a) Three Nansen bottle casts to 200 meters for nitrate samples.
   b) Weekly secchi disk depth observations.

III) Marine Geochemistry.

The following samples for marine geochemical studies were obtained as follows:

1) Weekly oxygen samples from the hydro casts.

2) Nutrient samples: -once at standard depths from a hydro cast, once daily from this seawater loop and at hourly intervals for one 25 hour period also from the seawater loop.

3) Alkalinity sample once every three days from this seawater loop.

4) Two seawater C_{14} samples from this seawater loop.

5) Weekly duplicate air samples for CO_2 analysis.

IV) Marine Mammal, Bird and Observations for Other Institutes.

1) Marine mammal and bird logs were kept.
2) Rainwater and surface samples for Scripps Institute of Oceanography were obtained.

En route from Station P oceanographic Stations 10 to 3 inclusive were occupied and STD casts to 1500 meters were made. BT casts were made and surface salinity, nutrient and nitrate sample collected at all Line P Stations.

Data was processed by Messrs. P. Vandergugten, C. de Jong, B. Minkley and D. Smith, and assembled and edited for publication by Mr. K. Abbott-Smith.

Observational Procedures

Temperatures at depth were measured by deep-sea reversing thermometers of German (Richter and Wiese) or Japanese (Yoshino Keiki Co.) manufacture. Two protected thermometers were used on all Nansen bottles, and one unprotected thermometer was used on each bottle at depths of 300 m or greater. The accuracy of protected reversing thermometers is believed to be ± 0.02C.

Surface water temperatures were measured from a bucket sample using a deck thermometer of ± 0.1C accuracy.

Salinity determinations were made aboard ship with a Hytech model 6220 lab salinometer on cruise P-71-4 and with an Auto-Lab model 601 Mark 111 inductive salinometer on cruise P-71-5. Accuracy using duplicate determinations is estimated to be ±0.003 ppt.

Depth determinations were made using the "depth difference" method described in the U.S.N. Hydrographic Office Publication No. 607 (1955). Depth estimates have an approximate accuracy of ±5 m for depths less than 1000 m, and ±0.5% of depth for depths greater than 1000 m.

The dissolved oxygen analyses were done in the shipboard laboratory by a modified Winkler method (Carpenter, 1965).

Salinity-temperature-pressure data were obtained with a Bissett-Berman Model 9006 STD on cruise P-71-4 and with a Bissett-Berman Model 9040 STD on cruise P-71-5.

Computations.

All hydrographic data were processed with the aid of an IBM 360 computer. Reversing thermometer temperature corrections, thermometric depth calculations, and accepted depth from the "depth difference" method were computed. Extraneous thermometric depths caused by thermometer malfunctions are automatically edited and replaced. A Calcomp 563 Offline Plotter was used to plot temperature-salinity and temperature-oxygen diagrams, as well as plots of temperature, salinity and dissolved oxygen vs $\log_{10}$

depth. These plots were used to check the data for errors.

Missing hydrographic data were obtained using a weighted parabolas interpolation method (Reiniger and Ross, 1968). These data are indicated with an asterisk in this data record.

Data values that we suspect and are included in this data record are indicated with a plus. These data have been removed from punch card and magnetic tape records.

Analog records from the salinity-temperature-pressure instrument have been hand digitized, then replotted using the Calcomp Plotter. Digitization was continued until original and computer plotted traces were coincident. Temperature and salinity values were listed at standard pressures; integrals (depths, geopotential anomaly, and potential energy anomaly) were computed from the entire array of digitized data.

The headings for the data listings are explained as follows:

PRESS	is pressure (decibars)
TEMP	is temperature (degrees Celsius)
SAL	is salinity (parts per thousand)
DEPTH	is reported in meters
SIGMA-T	is specific gravity anomaly
SVA	is specific volume anomaly
THETA	is potential temperature (degrees Celsius)
SVA (THETA)	is potential specific volume anomaly
DELTA D	is geopotential anomaly (J/kg)
POT EN	is potential energy in units of 10^8 ergs/cm^2
OXY	is the concentration of dissolved oxygen expressed in milliliters per liter
V-B	is the Väisälä-Brunt period in minutes

Summary of Hydrographic Data

The data are graphically summarized as follows:

Composite plots of temperature vs $\log_{10}$ depth (Fig. 4, P-71-4) and (Figs. 10, 11, P-71-5).

Composite plots of salinity vs $\log_{10}$ depth (Fig. 5, P-71-4) and (Figs. 12, 13, P-71-5).

Composite plots of oxygen vs $\log_{10}$ depth (Fig. 6, P-71-4) and (Figs. 14, 15, P-71-5).

REFERENCES

Carpenter, J.H. 1965. The Chesapeake Bay Institute Technique for the Winkler Dissolved Oxygen Method. Limmnol. & Oceaogr., 10: 141-143.

Collins, C.A., R.L. Tripe, D. A. Healey, and J. Joergensen, 1969. The Time Distribution of Serial Oceanographic Data from the Ocean Station P Program. Fisheries Research Board of Canada, Technical Report No. 106.

Reiniger, R.F. and C.K. Ross, 1968. A Method of Interpolation with Application to Oceanographic Data. Deep Sea Re. 15: 185-193.

U.S.N. Hydrographic Office, 1955. Instruction Manual for Oceanographic Observations, Publication No. 607.

LIST OF FIGURES

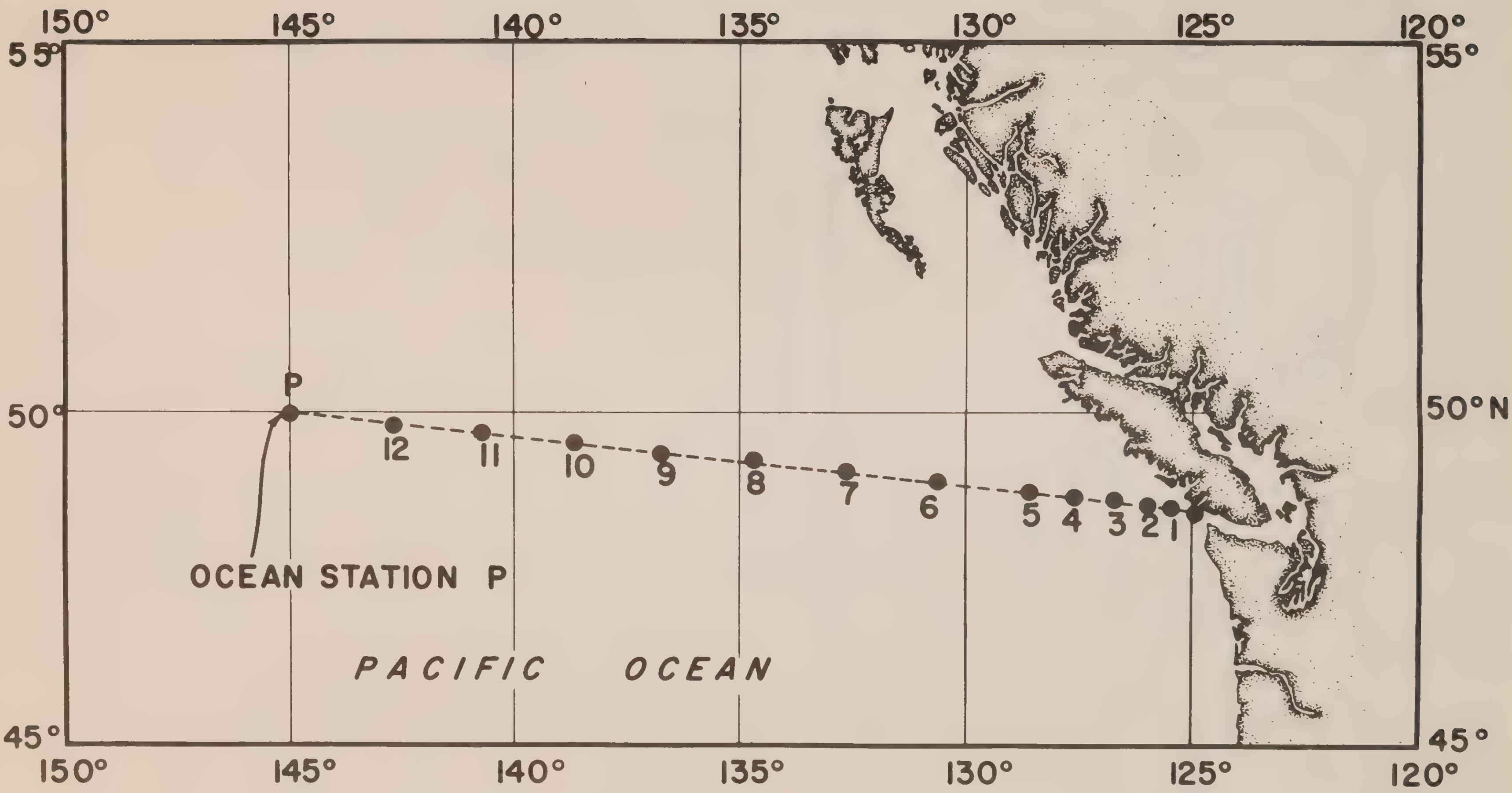


Fig. 1 Chart showing Line P station positions.

OCEANOGRAPHIC DATA OBTAINED ON CRUISE P-71-4

(CODC REFERENCE NO. 02-71-004)

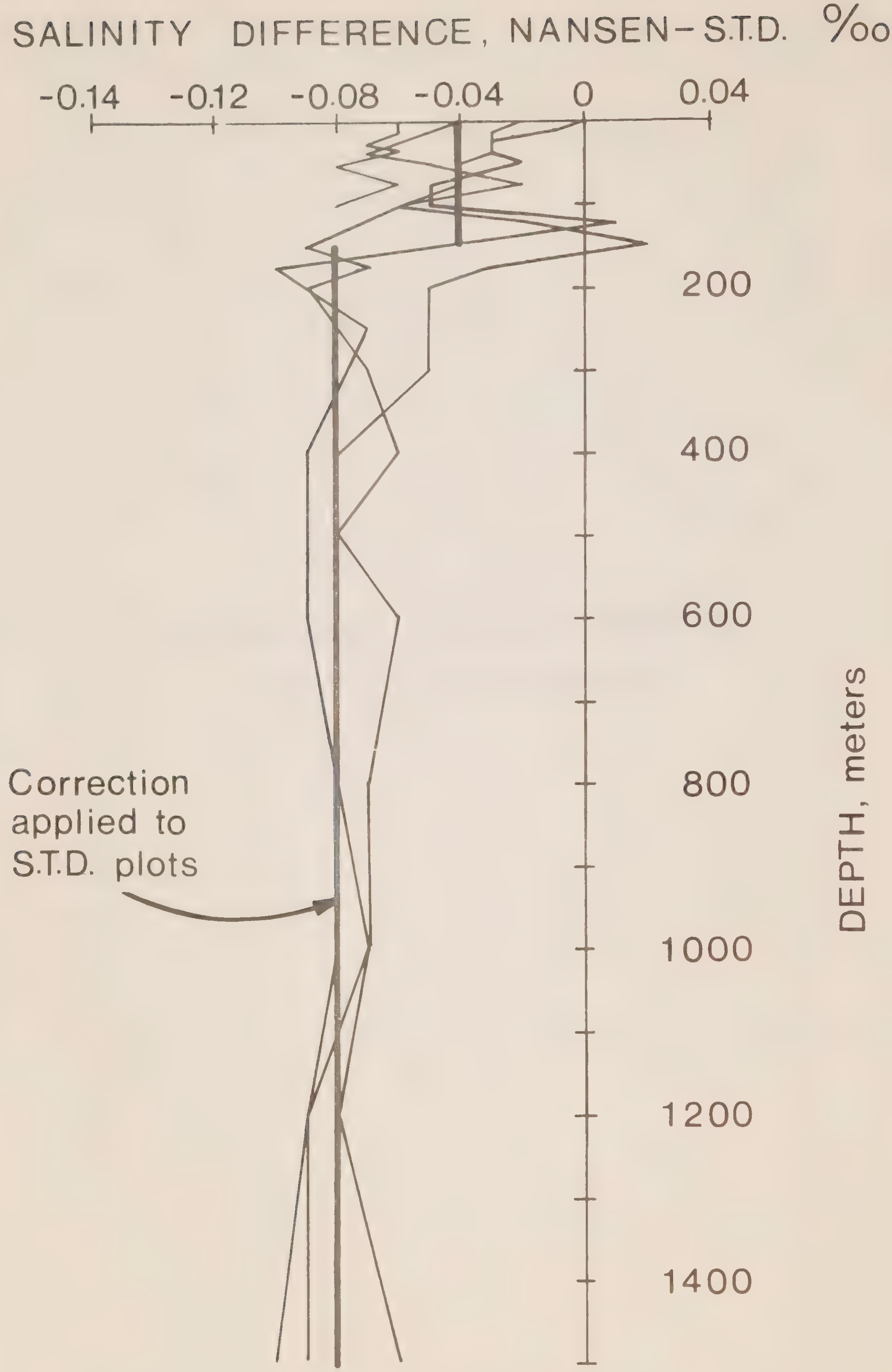


Fig. 2 Bottle - STD salinity value difference profiles P-71-4.

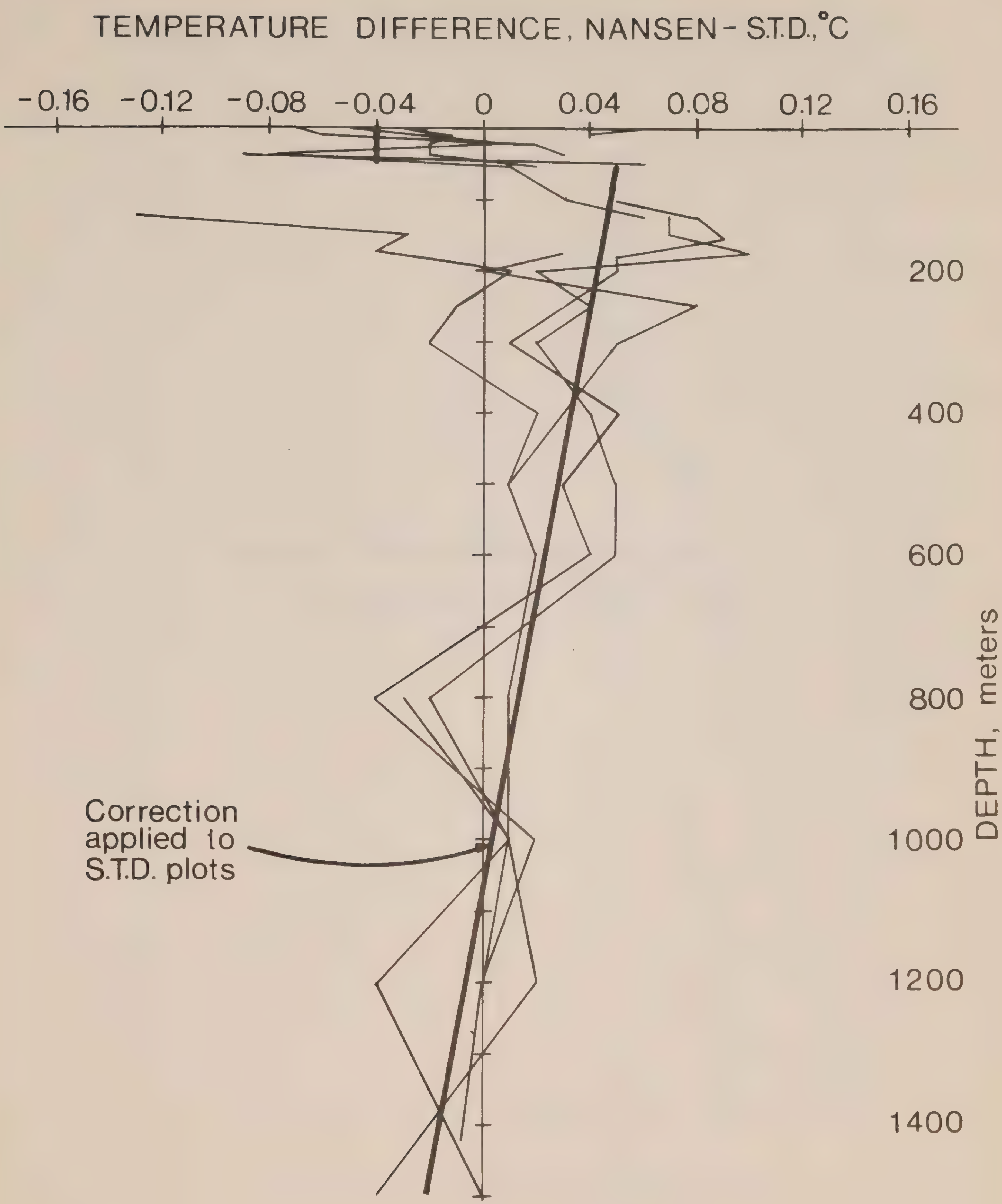


Fig. 3 Reversing thermometer - STD temperature difference profiles P-71-4.

COMPOSITE PLOTS OF TEMPERATURE, SALINITY

AND DISSOLVED OXYGEN vs DEPTH

(P-71-4)

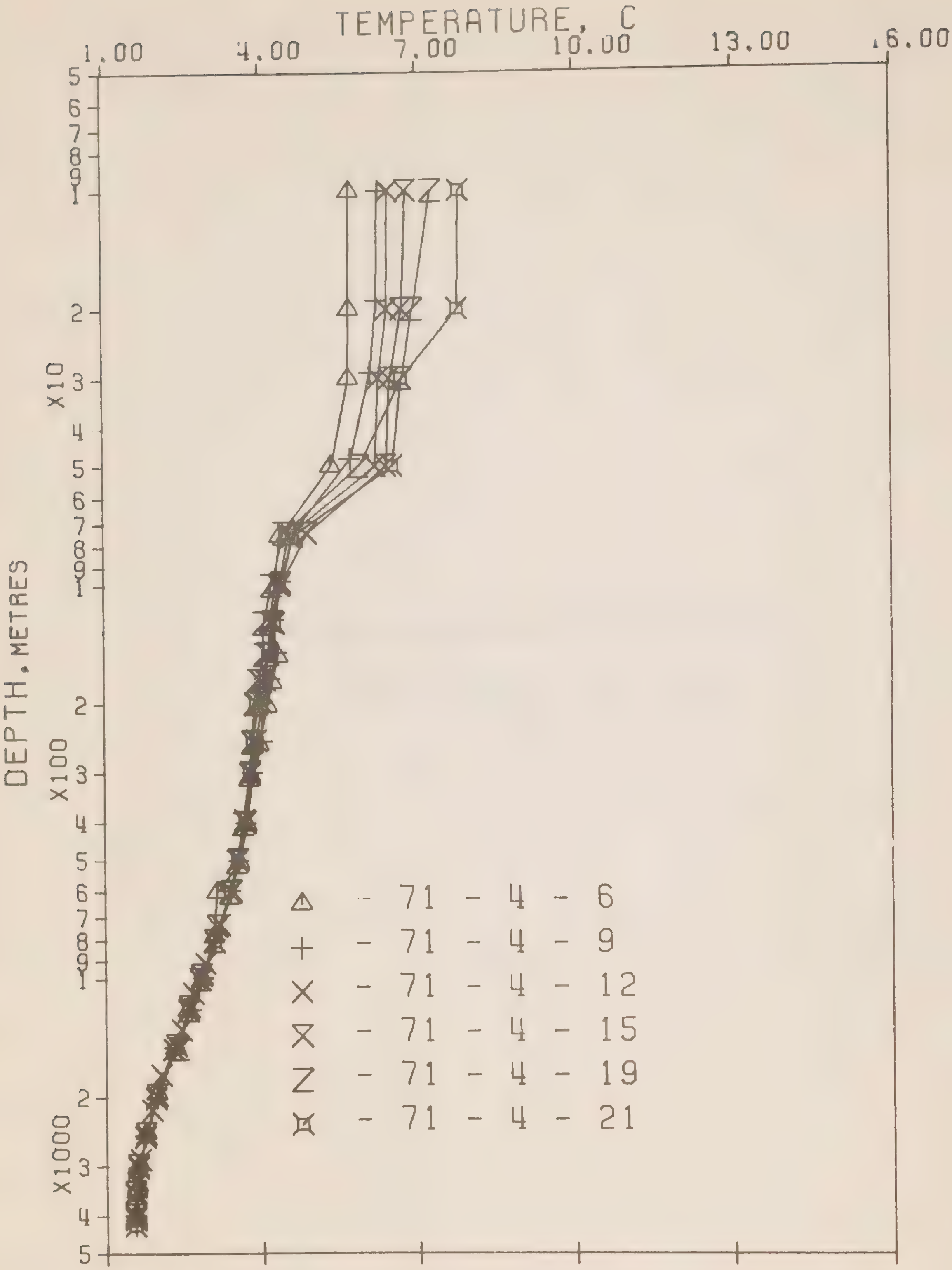


Fig. 4 Composite plot of temperature vs $\log_{10}$ depth P-71-4.

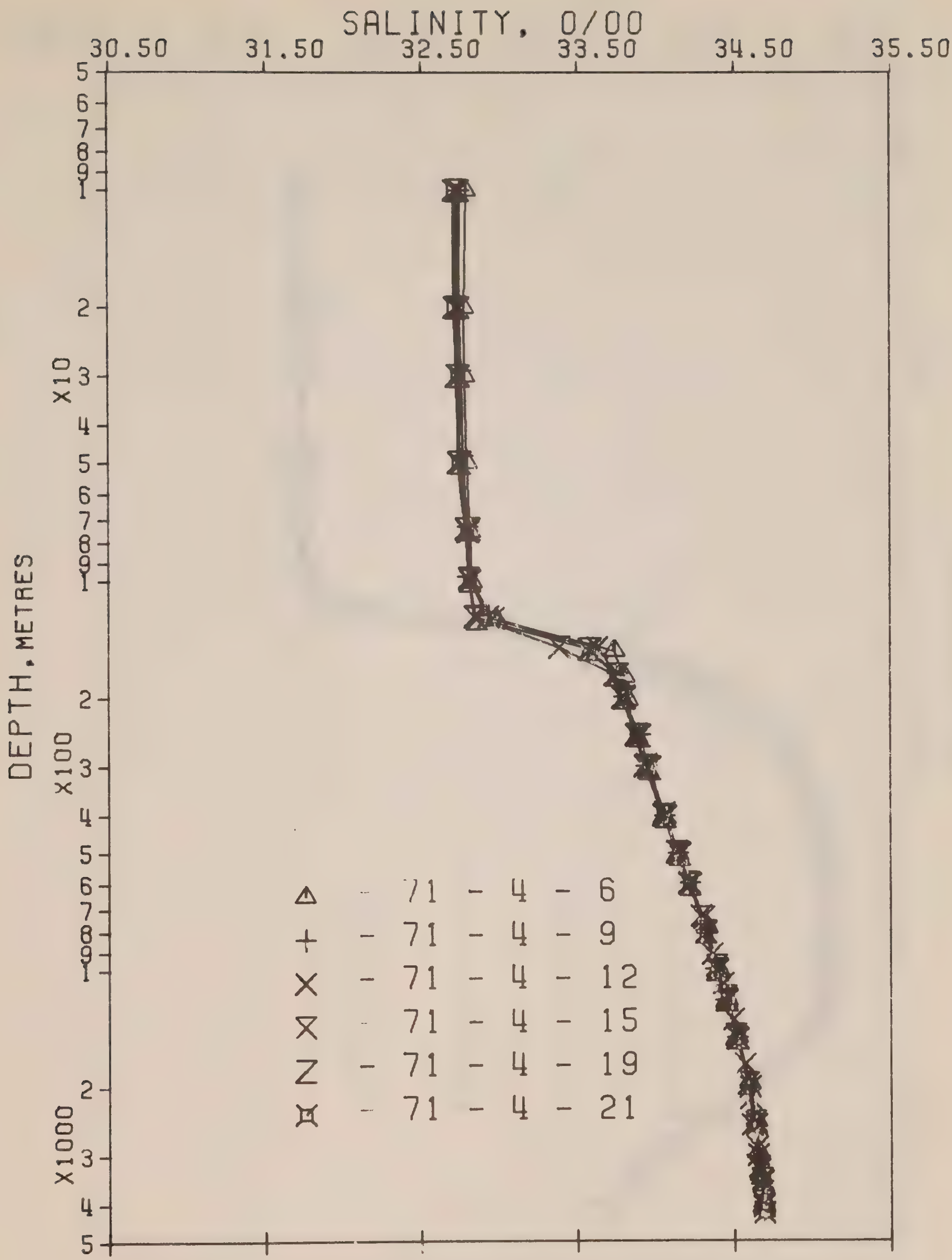


Fig. 5 Composite plot of salinity vs $\log_{10}$ depth P-71-4.

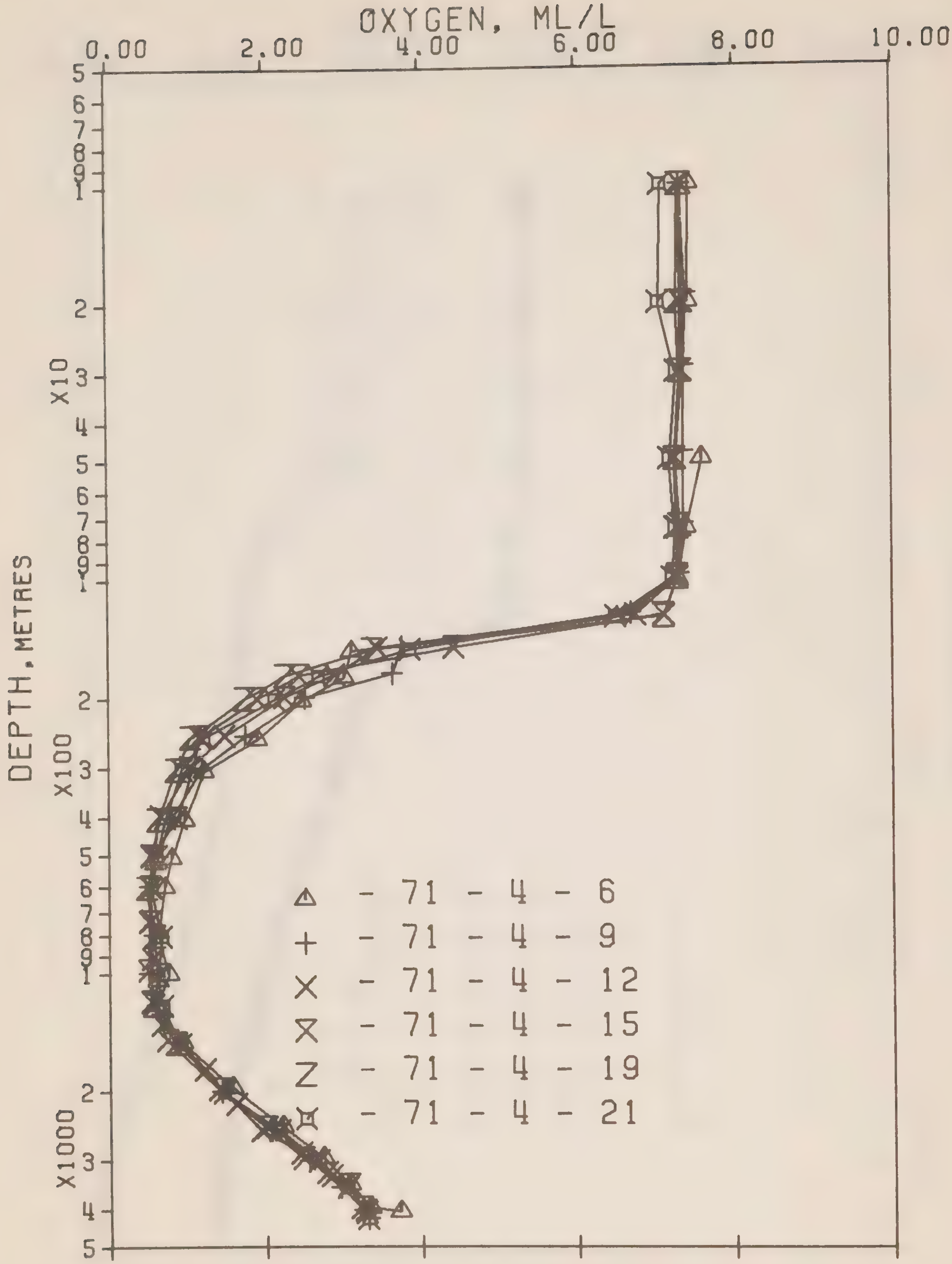
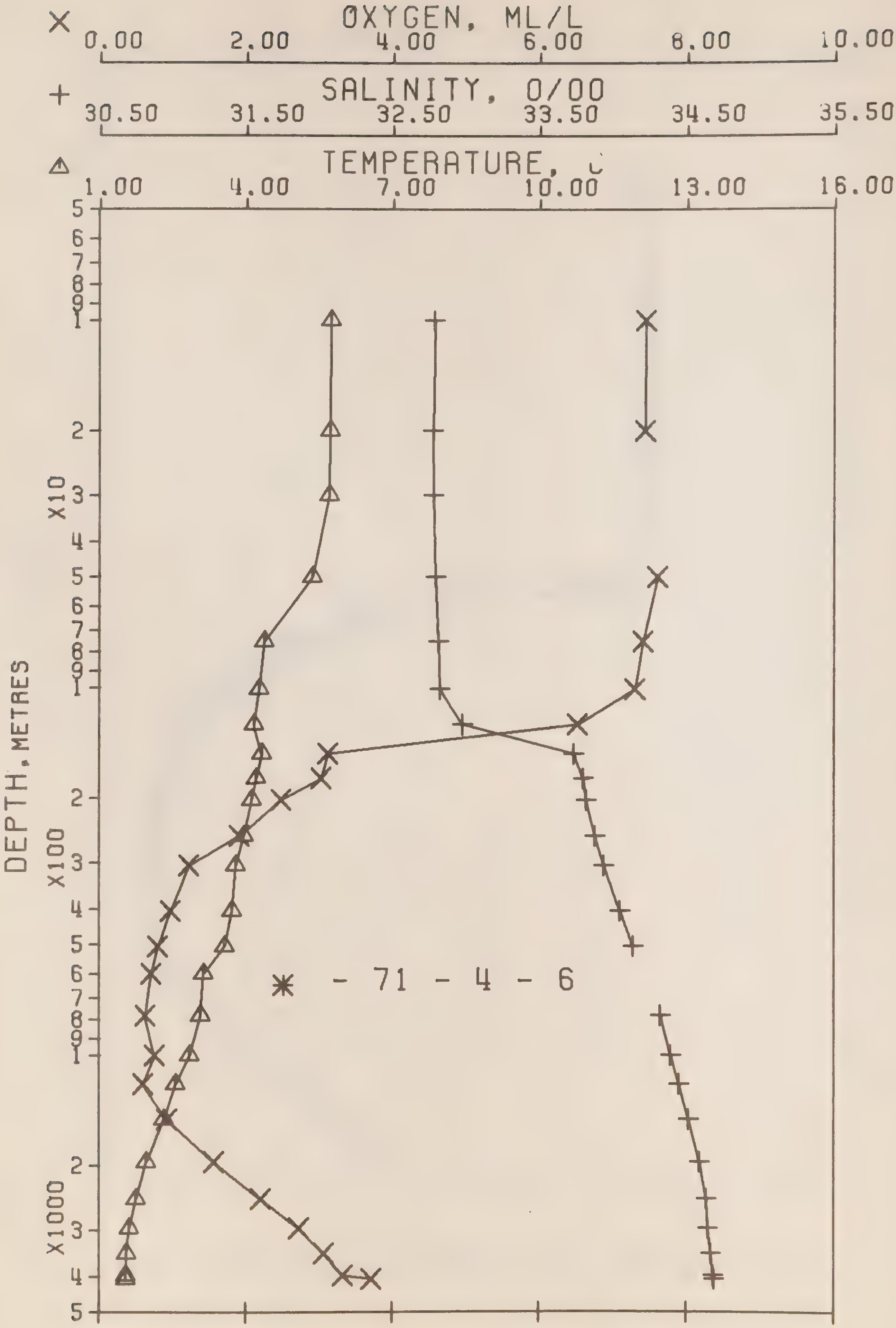


Fig. 6 Composite plot of salinity vs $\log_{10}$ depth P-71-4.

RESULTS OF BOTTLE CASTS

(P-71-4)

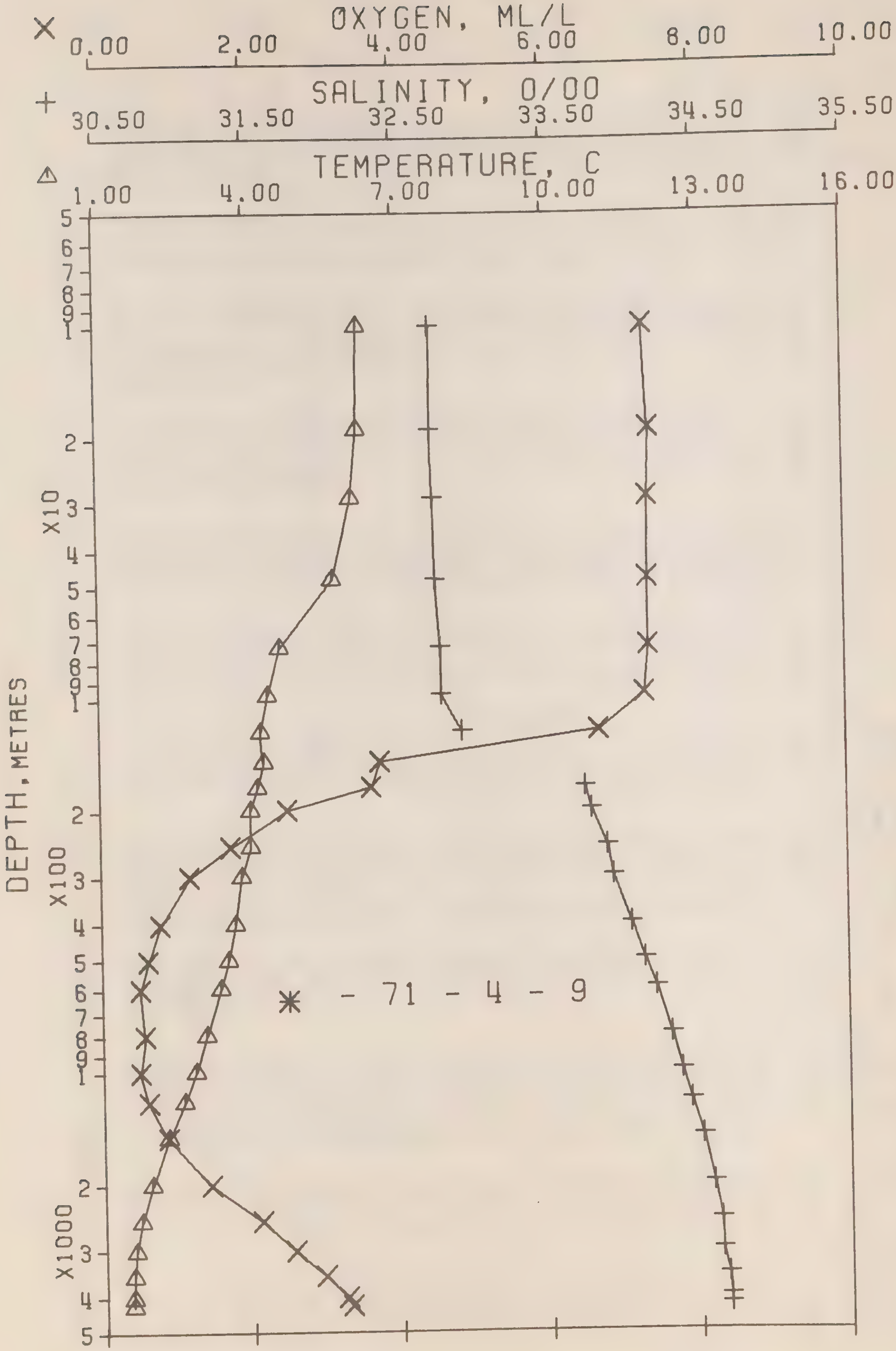


OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 4 - 6

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 6 DATE 19/ 5/71
POSITION 50- 0.0 N, 145- 2.0 W GMT 19.5
HYDROGRAPHIC CAST DATA

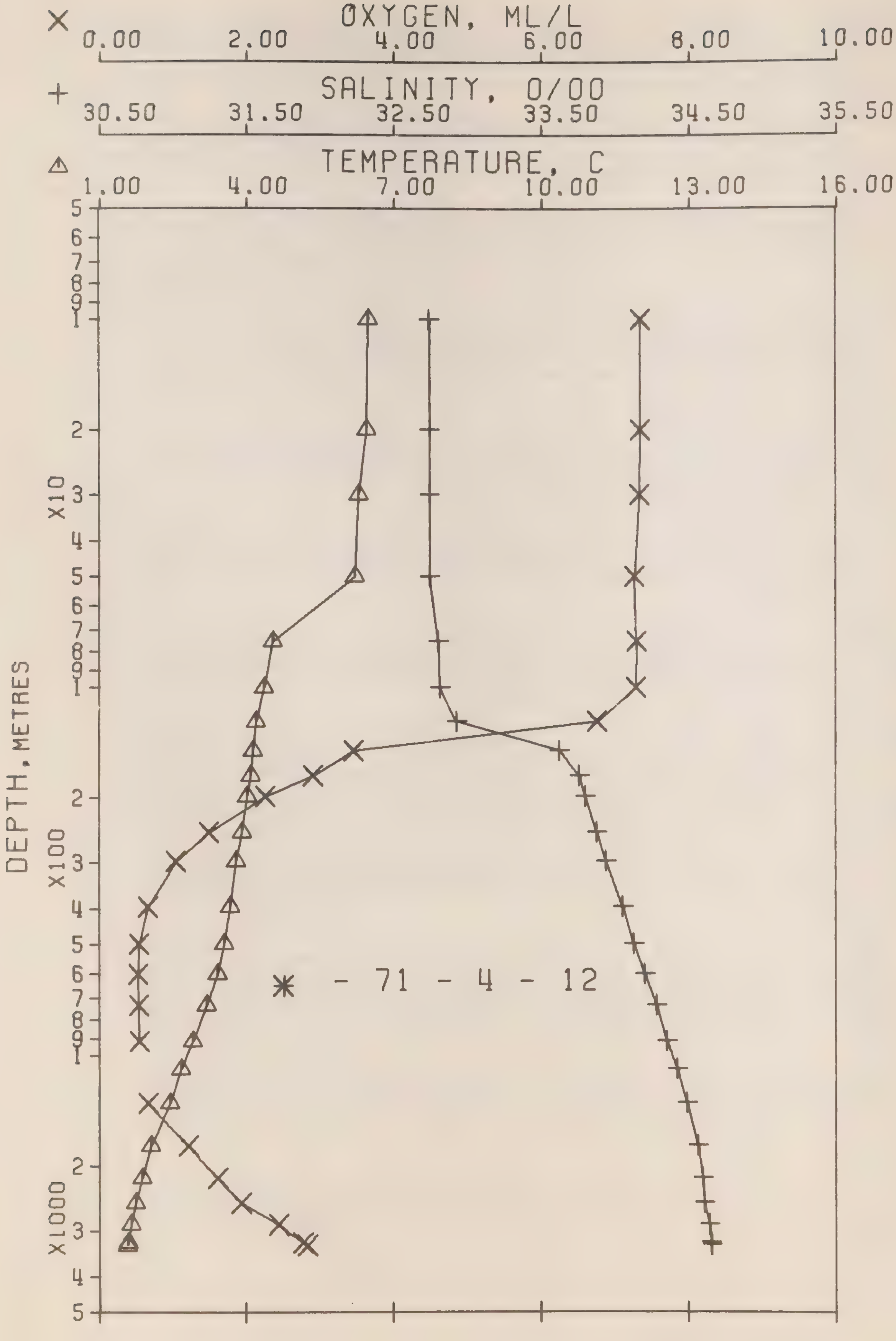
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	5.72	32.782	0	25.861	215.0	5.72	214.8	0.0	0.0	7.52	1471.
10	5.72	32.778	10	25.858	215.5	5.72	215.2	0.22	0.01	7.44	1471.
20	5.71	32.776*	20	25.857	215.6	5.71	215.2	0.43	0.04	7.43	1471.
30	5.69	32.778	30	25.861	215.3	5.69	214.8	0.65	0.10	0.0	1471.
50	5.35	32.796	50	25.915	210.4	5.35	209.6	1.08	0.28	7.60	1470.
75	4.36	32.814	75	26.038	198.8	4.35	198.0	1.59	0.61	7.40	1467.
102	4.25	32.824	101	26.057	197.1	4.24	196.1	2.11	1.08	7.29	1467.
127	4.15	32.980	126	26.191	184.6	4.14	183.4	2.60	1.65	6.51	1467.
153	4.32	33.736	152	26.773	129.8	4.31	128.1	3.01	2.23	3.11	1469.
178	4.20	33.799	177	26.836	124.0	4.19	122.2	3.32	2.76	3.02	1469.
204	4.11	33.819	203	26.861	121.9	4.10	119.7	3.65	3.38	2.47	1469.
256	3.94	33.879	254	26.926	116.0	3.92	113.6	4.26	4.82	1.90	1469.
307	3.78	33.942	305	26.992	110.1	3.76	107.3	4.84	6.49	1.21	1470.
409	3.70	34.051	406	27.087	101.9	3.67	98.2	5.92	10.43	0.96	1471.
510	3.55	34.139	506	27.171	94.6	3.51	90.2	6.91	15.08	0.79	1472.
607	3.11	34.214*	602	27.273	85.1	3.07	80.5	7.78	20.03	0.70	1472.
788	3.05	34.323	781	27.365	77.6	3.00	71.6	9.24	30.40	0.62	1475.
1013	2.83	34.396	1003	27.443	71.2	2.76	64.2	10.90	45.71	0.75	1478.
1213	2.55	34.450	1201	27.511	65.2	2.47	57.6	12.27	61.21	0.59	1480.
1516	2.30	34.516	1499	27.584	59.1	2.20	50.5	14.14	87.25	0.92	1484.
1978	1.95	34.589	1954	27.671	51.6	1.81	42.1	16.68	132.50	1.56	1490.
2489	1.73	34.633	2456	27.723	47.6	1.55	37.0	19.20	189.72	2.20	1498.
3004	1.60	34.645	2960	27.742	46.6	1.38	34.9	21.61	257.37	2.72	1506.
3520	1.54	34.667	3465	27.764	45.6	1.27	32.5	23.99	336.38	3.06	1515.
4037	1.53	34.679	3969	27.775	46.1	1.20	31.1	26.36	427.69	3.32	1523.
♦ 4140	1.53	34.685	4069	27.780	45.9	1.19	30.6	26.83	447.36	3.71	1525.

♦ Oxygen data suspect - Not archived


OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
- 71 - 4 - 9

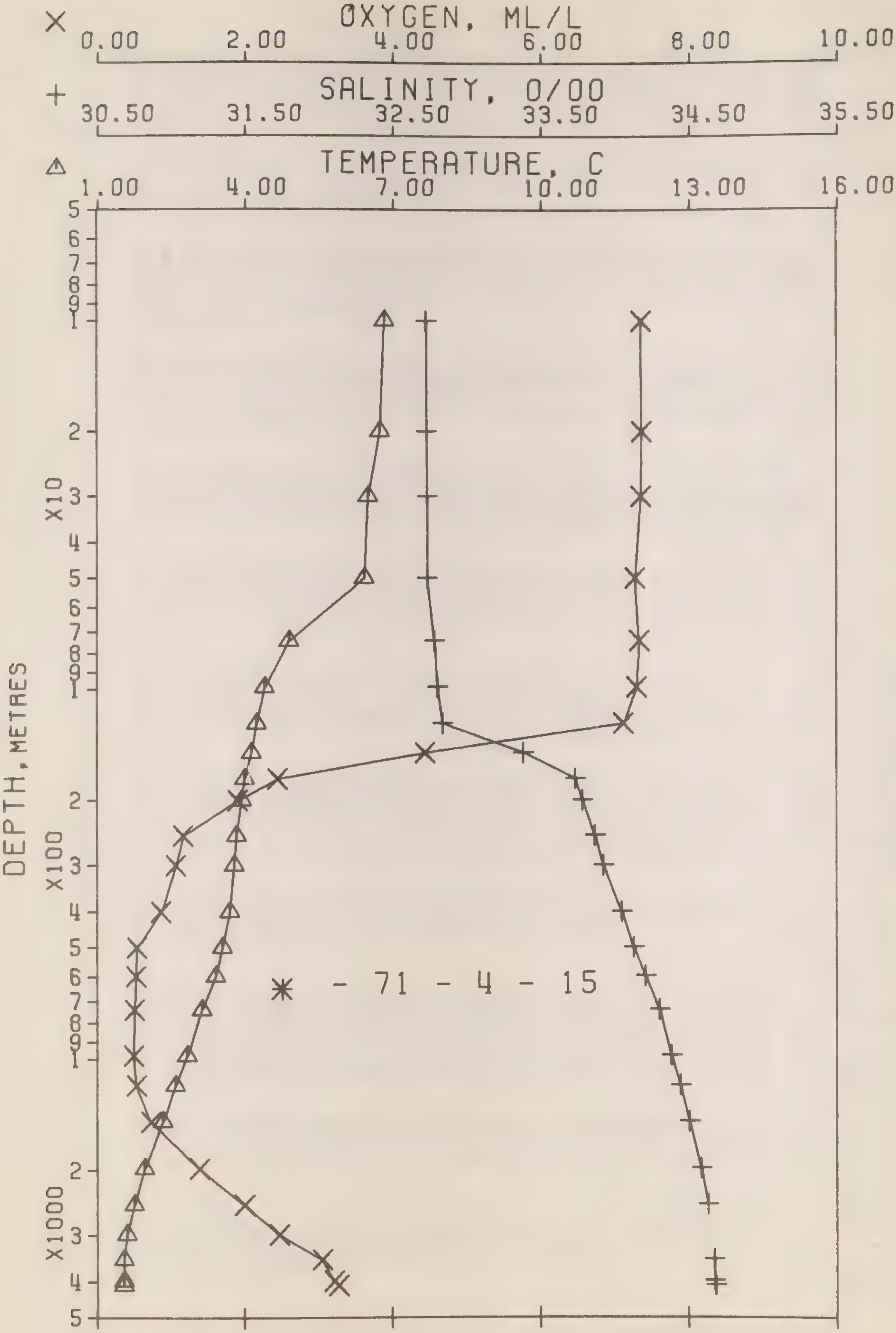
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 9 DATE 24/ 5/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 19.0
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	6.32	32.754	0	25.765	224.2	6.32	224.0	0.0	0.0	7.33	1473.
10	6.28	32.750	10	25.767	224.1	6.28	223.8	0.23	0.01	7.34	1473.
19	6.25	32.745	19	25.767	224.2	6.25	223.8	0.43	0.04	7.41	1473.
29	6.11	32.758	29	25.794	221.7	6.11	221.1	0.65	0.10	7.38	1473.
48	5.73	32.768	48	25.849	216.7	5.73	216.0	1.07	0.26	7.37	1472.
73	4.65	32.799	73	25.996	202.9	4.64	202.0	1.60	0.59	7.37	1468.
99	4.39	32.802	98	26.025	200.2	4.38	199.1	2.11	1.04	7.31	1467.
124	4.24	32.942	123	26.152	188.3	4.23	187.1	2.60	1.60	6.69	1467.
149	4.30	33.363*	148	26.480	157.6	4.29	155.9	3.04	2.20	3.76	1468.
174	4.17	33.753	173	26.802	127.2	4.16	125.4	3.39	2.79	3.64	1469.
200	4.02	33.797	199	26.853	122.5	4.01	120.6	3.72	3.40	2.51	1469.
251	4.01	33.899	249	26.935	115.2	3.99	112.7	4.31	4.78	1.74	1470.
302	3.82	33.934	300	26.982	111.1	3.80	108.3	4.90	6.42	1.18	1470.
405	3.68	34.055	402	27.092	101.4	3.65	97.8	5.99	10.36	0.78	1471.
506	3.54	34.138	502	27.172	94.5	3.50	90.1	6.98	14.95	0.61	1472.
604	3.37	34.216	599	27.250	87.7	3.33	82.7	7.87	19.99	0.50	1473.
804	3.07	34.316	797	27.358	78.4	3.02	72.4	9.52	31.84	0.56	1475.
1007	2.84	34.381	997	27.430	72.4	2.77	65.3	11.04	45.90	0.49	1478.
1210	2.60	34.438	1198	27.497	66.7	2.52	59.0	12.46	61.89	0.60	1480.
1516	2.27	34.513	1499	27.585	59.0	2.17	50.5	14.37	88.43	0.86	1484.
2028	1.93	34.583	2003	27.668	52.1	1.79	42.5	17.18	139.30	1.43	1491.
2542	1.71	34.631	2508	27.723	47.6	1.53	37.0	19.72	198.50	2.11	1499.
3059	1.58	34.633	3014	27.734	47.3	1.35	35.6	22.17	268.44	2.55	1507.
3578	1.54	34.674	3521	27.770	45.3	1.26	31.9	24.57	349.54	2.95	1516.
4096	1.53	34.685	4027	27.780	45.8	1.20	30.6	26.92	441.61	3.24	1524.
4305	1.53	34.686	4230	27.780	46.3	1.17	30.4	27.88	482.70	3.30	1528.


OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 4 - 12

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 12 DATE 2/ 6/71
POSITION 49-58.0 N, 145- 2.0 W GMT 18.8
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	6.48	32.745	0	25.737	226.8	6.48	226.6	0.0	0.0	0.0	1474.
10	6.47	32.746	10	25.739	226.7	6.47	226.4	0.23	0.01	7.34	1474.
20	6.44	32.746	20	25.743	226.5	6.44	226.0	0.46	0.05	7.34	1474.
30	6.28	32.745	30	25.763	224.7	6.28	224.1	0.68	0.11	7.33	1474.
50	6.20	32.747	50	25.774	223.9	6.20	223.1	1.14	0.29	7.26	1474.
75	4.53	32.807	75	26.015	201.0	4.52	200.1	1.67	0.63	7.29	1467.
101	4.35	32.815	100	26.040	198.8	4.34	197.8	2.17	1.08	7.28	1467.
125	4.18	32.930	124	26.148	188.7	4.17	187.4	2.65	1.63	6.75	1467.
150	4.12	33.626	149	26.707	136.0	4.11	134.4	3.06	2.20	3.45	1468.
175	4.07	33.758	174	26.817	125.8	4.06	124.0	3.38	2.74	2.90	1468.
199	4.00	33.802	198	26.859	122.0	3.99	119.9	3.68	3.31	2.25	1468.
250	3.90	33.878	248	26.929	115.7	3.88	113.2	4.28	4.68	1.48	1469.
299	3.77	33.938	297	26.990	110.2	3.75	107.4	4.83	6.24	1.03	1469.
399	3.65	34.056	396	27.096	101.0	3.62	97.4	5.89	9.98	0.65	1471.
501	3.54	34.131	497	27.166	95.0	3.51	90.6	6.88	14.56	0.53	1472.
605	3.40	34.206	600	27.239	88.7	3.36	83.7	7.84	19.95	0.52	1473.
736	3.17	34.283	729	27.322	81.4	3.12	75.7	8.95	27.51	0.53	1474.
925	2.89	34.357	916	27.407	74.2	2.83	67.7	10.41	39.94	0.54	1476.
1102	2.65	34.427	1091	27.484	67.5	2.58	60.3	11.67	52.87	0.0	1478.
1362	2.42	34.488	1347	27.552	61.8	2.33	53.7	13.33	73.84	0.66	1482.
1779	2.03	34.563	1758	27.644	53.7	1.91	44.8	15.73	112.08	1.21	1487.
2178	1.85	34.594	2150	27.683	50.8	1.70	40.9	17.80	153.84	1.61	1493.
2557	1.72	34.606	2522	27.702	49.7	1.54	39.0	19.70	199.84	1.93	1499.
2914	1.63	34.641	2872	27.737	47.0	1.42	35.4	21.43	247.88	2.44	1505.
3271	1.57	34.652	3222	27.750	46.4	1.32	34.0	23.09	300.49	2.77	1510.
3343	1.56	34.656	3292	27.754	46.2	1.31	33.5	23.43	311.67	2.83	1512.



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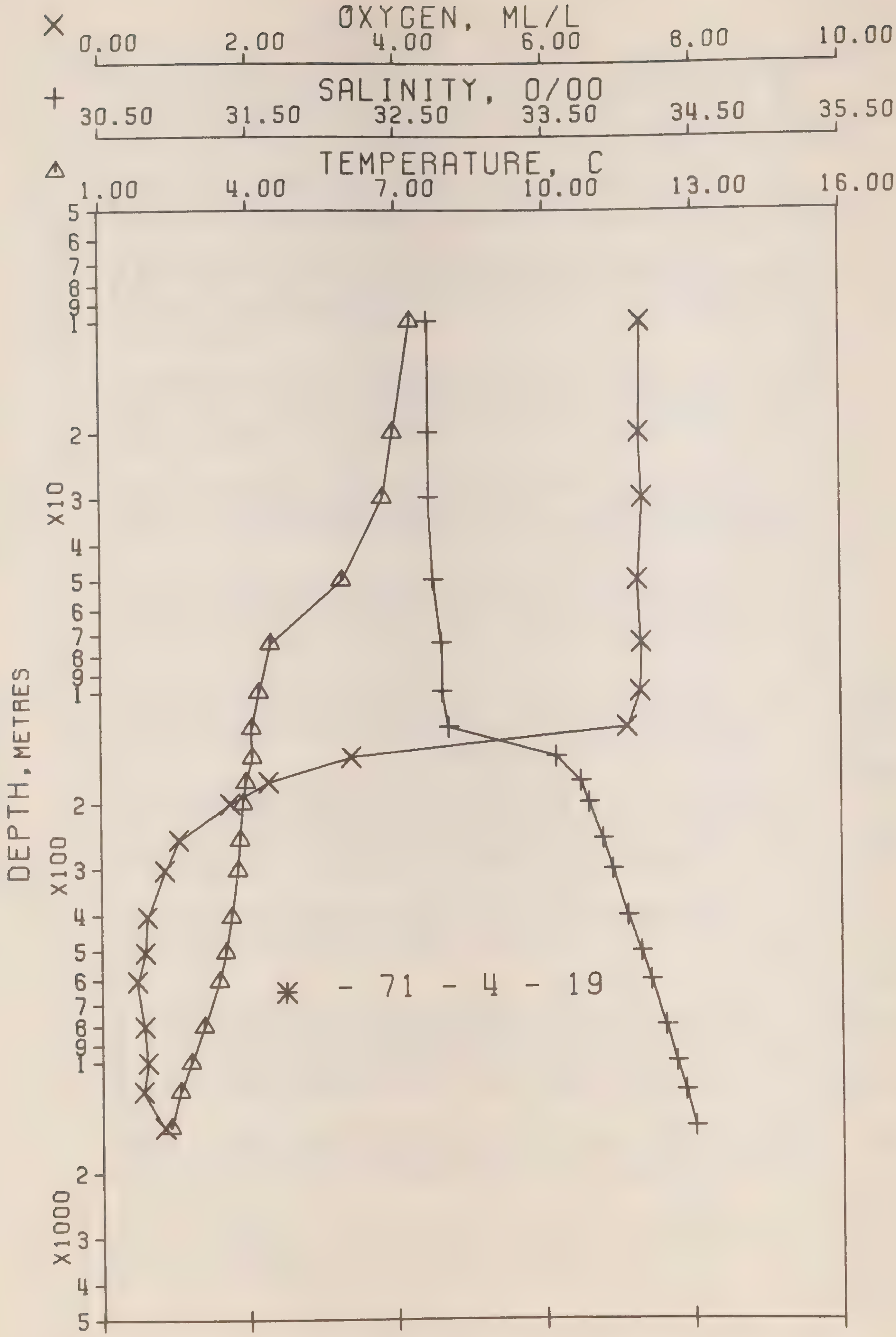
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
✱ - 71 - 4 - 15

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 15 DATE 7/ 6/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 18.6
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	6.85	32.732*	0	25.679	232.3	6.85	232.1	0.0	0.0	0.0	1475.
10	6.82	32.732	10	25.683	232.1	6.82	231.7	0.23	0.01	7.35	1476.
20	6.73	32.732	20	25.695	231.1	6.73	230.6	0.47	0.05	7.36	1475.
30	6.49	32.736	30	25.729	228.0	6.49	227.3	0.70	0.11	7.35	1475.
50	6.42	32.735	50	25.737	227.4	6.42	226.6	1.16	0.30	7.27	1475.
74	4.89	32.787	74	25.960	206.3	4.88	205.4	1.68	0.63	7.33	1469.
100	4.39	32.806	99	26.029	199.9	4.38	198.9	2.19	1.08	7.29	1467.
125	4.22	32.838	124	26.071	196.0	4.21	194.8	2.69	1.66	7.11	1467.
150	4.12	33.383	149	26.514	154.3	4.11	152.7	3.14	2.28	4.43	1468.
176	3.99	33.735	175	26.807	126.7	3.98	124.9	3.50	2.88	2.44	1468.
201	3.93	33.784	200	26.852	122.7	3.92	120.6	3.81	3.48	1.90	1468.
252	3.82	33.869	250	26.930	115.5	3.80	113.1	4.41	4.86	1.16	1469.
302	3.78	33.925	300	26.979	111.3	3.76	108.5	4.98	6.48	1.06	1469.
404	3.69	34.048	401	27.085	102.0	3.66	98.4	6.07	10.39	0.86	1471.
505	3.53	34.132	501	27.168	94.8	3.50	90.4	7.06	14.99	0.53	1472.
604	3.40	34.208	599	27.241	88.5	3.36	83.5	7.97	20.12	0.52	1473.
743	3.11	34.303	736	27.344	79.4	3.06	73.7	9.13	28.07	0.50	1474.
991	2.82	34.383	981	27.434	71.9	2.75	65.1	10.99	44.53	0.49	1477.
1190	2.58	34.444	1178	27.503	65.9	2.50	58.4	12.36	59.78	0.53	1480.
1492	2.32	34.507	1476	27.576	59.9	2.22	51.4	14.25	85.66	0.73	1484.
1997	1.94	34.587	1973	27.670	51.7	1.80	42.2	17.05	135.34	1.39	1490.
2507	1.73	34.628	2473	27.719	48.0	1.55	37.3	19.57	193.26	2.00	1498.
3018	1.59	34.653*	2974	27.750	45.9	1.37	34.2	21.96	260.58	2.47	1506.
3530	1.52	34.668	3475	27.767	45.3	1.25	32.3	24.29	338.28	3.05	1515.
4046	1.52	34.677	3978	27.774	46.0	1.19	31.2	26.64	429.04	3.21	1524.
4149	1.52	34.680	4078	27.776	46.1	1.18	30.9	27.11	448.78	3.27	1525.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+ SALINITY, 0/00
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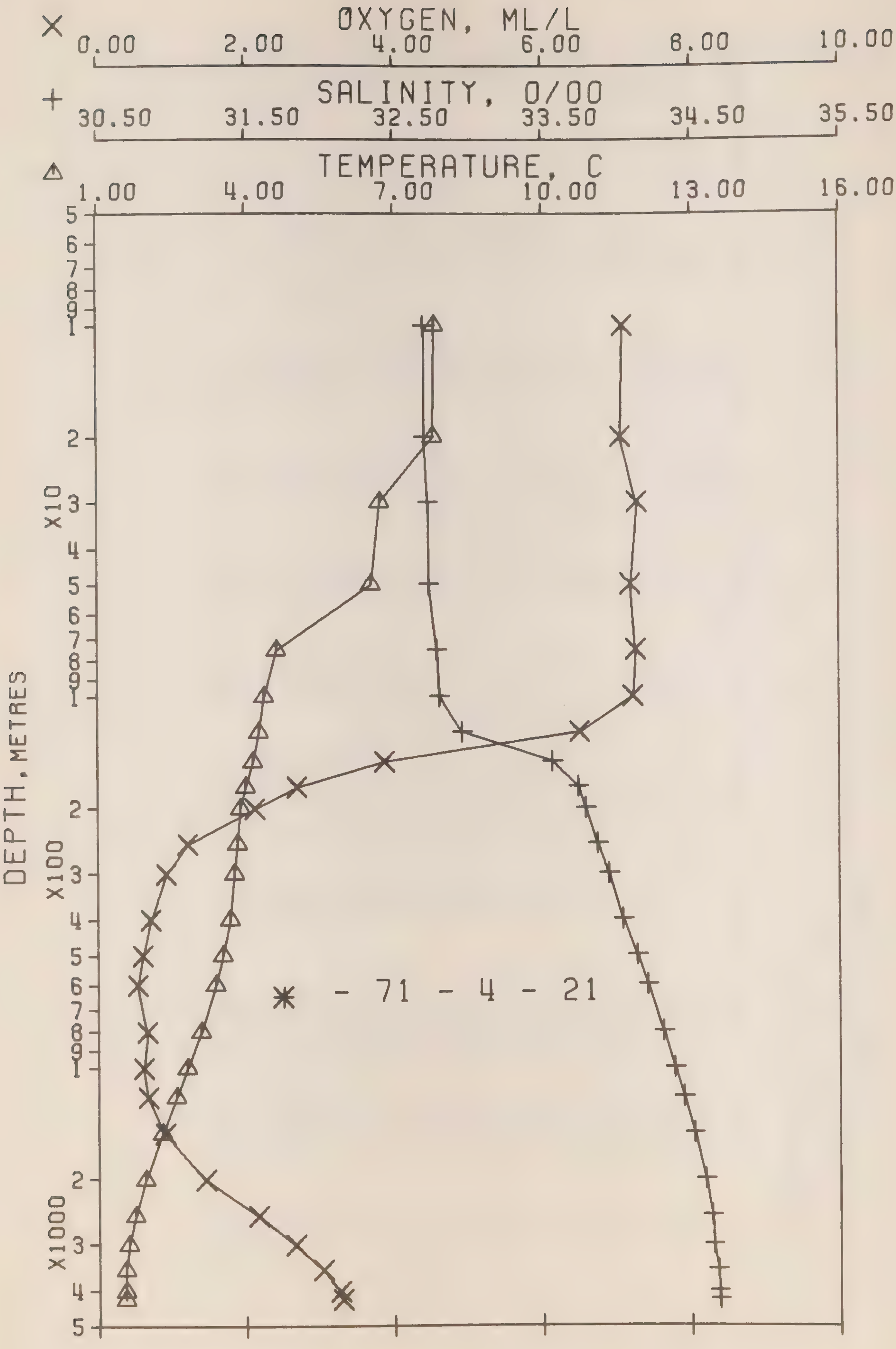
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
✳ - 71 - 4 - 19

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 19 DATE 15/ 6/71
POSITION 49-59.0 N, 145- 0.0 W GMT 18.8
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	7.49	32.729	0	25.589	240.9	7.49	240.6	0.0	0.0	7.21	1478.
10	7.30	32.726	10	25.613	238.7	7.30	238.4	0.24	0.01	7.31	1477.
20	6.94	32.725	20	25.661	234.3	6.94	233.7	0.48	0.05	7.29	1476.
30	6.73	32.725	30	25.689	231.7	6.73	231.1	0.71	0.11	7.33	1475.
50	5.89	32.756	50	25.820	219.6	5.89	218.7	1.17	0.30	7.26	1472.
74	4.43	32.808	74	26.026	199.9	4.42	199.1	1.67	0.62	7.31	1467.
101	4.19	32.811	100	26.053	197.5	4.18	196.5	2.19	1.08	7.29	1466.
126	4.04	32.857	125	26.105	192.8	4.03	191.6	2.69	1.66	7.11	1466.
151	4.06	33.582	150	26.678	138.7	4.05	137.1	3.11	2.24	3.38	1468.
176	3.92	33.744	175	26.821	125.4	3.91	123.6	3.44	2.79	2.26	1468.
201	3.87	33.801	200	26.871	120.8	3.86	118.8	3.74	3.38	1.74	1468.
253	3.81	33.895	251	26.952	113.5	3.79	111.1	4.35	4.77	1.04	1469.
304	3.76	33.960	302	27.008	108.5	3.74	105.7	4.92	6.39	0.85	1469.
407	3.63	34.058	404	27.099	100.7	3.60	97.0	5.99	10.29	0.61	1471.
509	3.50	34.151	505	27.186	93.1	3.46	88.8	6.98	14.90	0.58	1472.
609	3.37	34.215	604	27.249	87.8	3.33	82.7	7.88	20.05	0.47	1473.
807	3.05	34.315	800	27.359	78.3	3.00	72.3	9.52	31.89	0.57	1475.
1013	2.79	34.387	1003	27.440	71.4	2.72	64.5	11.05	46.12	0.61	1477.
1210	2.56	34.447	1198	27.507	65.6	2.48	58.0	12.40	61.41	0.55	1480.
1517	2.36	34.509	1500	27.574	60.3	2.26	51.5	14.32	88.07	0.84	1484.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SALINITY, 0/00
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32.50
33.50
34.50
35.50
TEMPERATURE, C
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7.00
10.00
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DEPTH, METRES
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X100
X1000
* - 71 - 4 - 21

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 21 DATE 21/ 6/71
POSITION 50- 0.0 N, 145- 1.0 W GMT 20.3
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	7.86	32.711	0	25.523	247.2	7.86	247.0	0.0	0.0	7.08	1479.
10	7.83	32.709	10	25.525	247.1	7.83	246.7	0.25	0.01	7.09	1479.
20	7.79	32.711	20	25.533	246.5	7.79	246.0	0.50	0.05	7.06	1479.
30	6.72	32.734	30	25.698	231.0	6.72	230.3	0.74	0.11	7.28	1475.
50	6.53	32.739	50	25.726	228.5	6.53	227.6	1.20	0.30	7.19	1475.
75	4.61	32.797	75	25.998	202.6	4.60	201.8	1.74	0.65	7.26	1468.
101	4.36	32.811	100	26.036	199.2	4.35	198.1	2.24	1.10	7.22	1467.
126	4.26	32.963	125	26.166	187.0	4.25	185.7	2.74	1.67	6.50	1467.
151	4.14	33.568	150	26.659	140.6	4.13	139.0	3.15	2.25	3.87	1468.
177	3.98	33.743	176	26.814	126.0	3.97	124.3	3.49	2.83	2.69	1468.
202	3.88	33.796	201	26.866	121.2	3.87	119.3	3.80	3.43	2.12	1468.
253	3.82	33.873	251	26.933	115.3	3.80	112.9	4.40	4.81	1.21	1469.
303	3.76	33.950	301	27.001	109.2	3.74	106.5	4.96	6.41	0.92	1469.
404	3.67	34.044	401	27.084	102.1	3.64	98.5	6.03	10.25	0.71	1471.
505	3.52	34.142	501	27.177	94.0	3.49	89.6	7.02	14.83	0.60	1472.
605	3.37	34.208	600	27.244	88.2	3.33	83.2	7.93	19.98	0.53	1473.
811	3.07	34.314	804	27.356	78.6	3.01	72.5	9.64	32.35	0.66	1475.
1015	2.79	34.390	1005	27.442	71.2	2.72	64.2	11.16	46.48	0.61	1478.
1219	2.56	34.449	1206	27.509	65.5	2.48	57.8	12.54	62.28	0.67	1480.
1525	2.27	34.518	1508	27.589	58.7	2.17	50.1	14.44	88.76	0.90	1484.
2036	1.93	34.596	2011	27.678	51.2	1.79	41.5	17.22	139.20	1.45	1491.
2548	1.72	34.634	2514	27.725	47.6	1.54	36.8	19.73	197.83	2.16	1499.
3064	1.59	34.647	3019	27.745	46.5	1.36	34.6	22.14	267.02	2.66	1507.
3581	1.53	34.675	3524	27.772	45.1	1.25	31.7	24.50	346.87	3.03	1516.
4099	1.52	34.682	4030	27.778	45.8	1.19	30.8	26.85	438.76	3.26	1524.
4308	1.53	34.683	4233	27.778	46.4	1.17	30.6	27.81	479.95	3.29	1528.

RESULTS OF STD CASTS

(P-71-4)

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 1 DATE 15/ 5/71
POSITION 48-33.0N, 125-33.0W GMT 0.7
RESULTS OF STP CAST 41 POINTS TAKEN FROM ANALOG TRACE

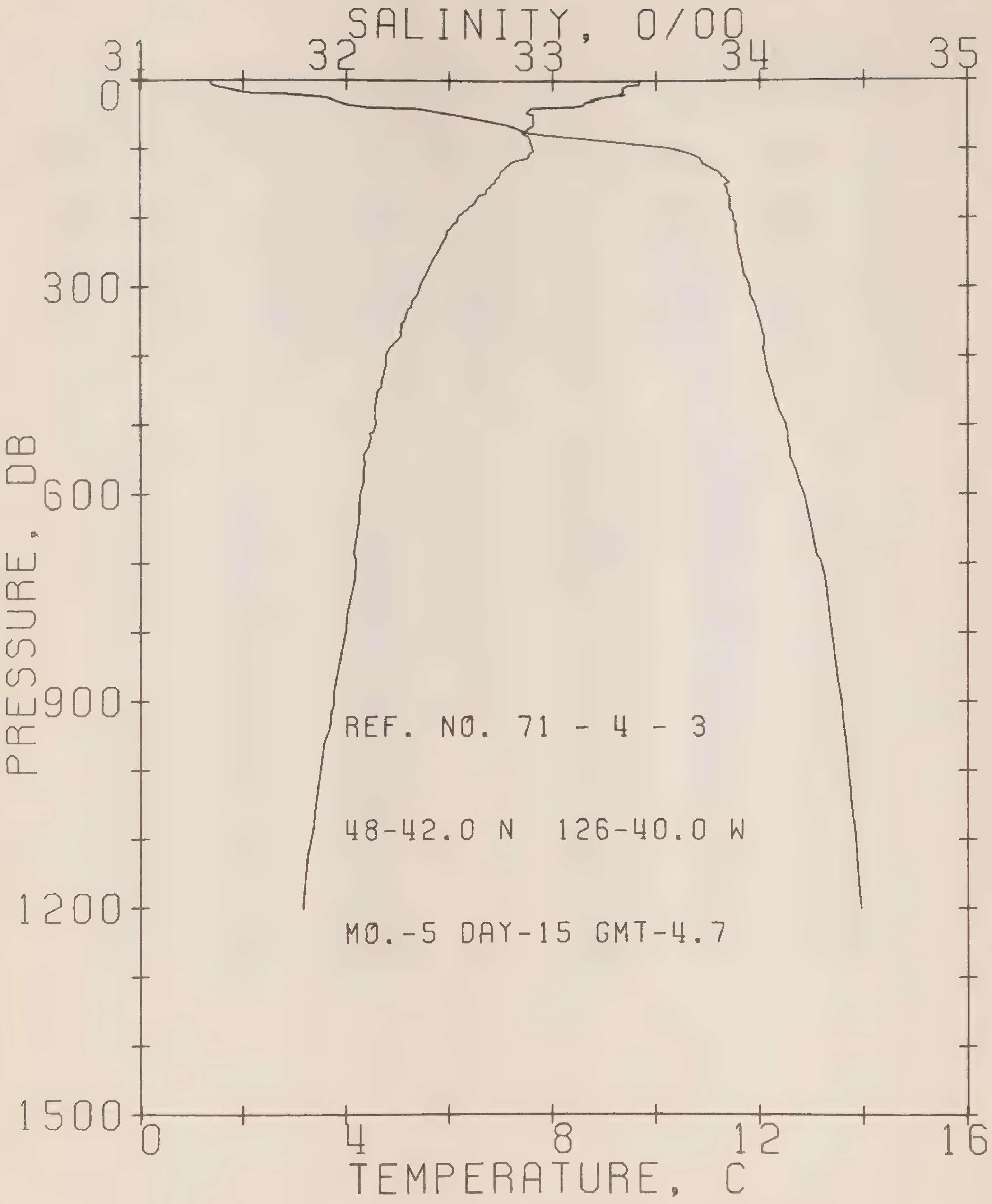
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.78	31.11	0	23.98	393.9	0.0	0.0	1485.
10	9.14	31.32	10	24.24	369.0	0.39	0.02	1483.
20	8.57	31.53	20	24.49	345.3	0.75	0.07	1481.
30	7.48	32.14	30	25.13	285.1	1.06	0.15	1478.
50	7.18	32.98	50	25.83	218.8	1.58	0.36	1478.
75	7.07	33.37	75	26.15	188.2	2.09	0.68	1478.
100	6.88	33.67	99	26.42	163.7	2.53	1.08	1478.

DEPTH	TEMP	SAL	DEPTH	TEMP	SAL
0.	9.78	31.11	36.	7.39	32.27
4.	9.78	31.15	40.	7.36	32.36
5.	9.84	31.16	47.	7.21	32.80
6.	9.79	31.17	49.	7.20	32.92
8.	9.19	31.26	50.	7.18	32.98
9.	9.16	31.30	55.	7.26	33.04
10.	9.14	31.32	56.	7.23	33.06
12.	9.12	31.34	61.	7.17	33.18
14.	9.11	31.35	66.	7.13	33.26
16.	9.06	31.36	72.	7.09	33.34
18.	8.76	31.40	78.	7.05	33.41
19.	8.63	31.50	86.	7.05	33.46
20.	8.57	31.53	88.	7.03	33.49
22.	8.55	31.59	90.	6.97	33.57
23.	8.50	31.62	97.	6.88	33.67
25.	7.59	31.94	103.	6.88	33.68
26.	7.55	32.06	104.	6.89	33.68
27.	7.51	32.11	114.	6.89	33.70
32.	7.46	32.16	115.	6.88	33.70
34.	7.46	32.20	120.	6.88	33.72
35.	7.41	32.23			

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 2 DATE 15/ 5/71
POSITION 48-38.0N, 126- 0.0W GMT 2.7
RESULTS OF STP CAST 46 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.37	31.55	0	24.39	355.0	0.0	0.0	1484.
10	9.18	31.57	10	24.43	351.3	0.35	0.02	1483.
20	8.13	31.80	20	24.77	319.1	0.69	0.07	1480.
30	7.45	32.27	30	25.24	274.8	0.99	0.15	1478.
50	7.36	33.04	50	25.85	216.7	1.47	0.34	1479.
75	7.50	33.45	75	26.16	188.0	1.98	0.66	1480.
100	6.75	33.82	99	26.55	151.3	2.40	1.03	1478.

DEPTH	TEMP	SAL	DEPTH	TEMP	SAL
0.	9.37	31.55	50.	7.36	33.04
6.	9.38	31.56	51.	7.45	33.06
7.	9.30	31.56	54.	7.40	33.12
8.	9.23	31.56	55.	7.46	33.19
11.	9.15	31.57	62.	7.48	33.22
12.	9.05	31.58	63.	7.51	33.24
14.	8.76	31.63	68.	7.52	33.34
16.	8.67	31.72	70.	7.51	33.39
17.	8.22	31.73	77.	7.49	33.48
20.	8.13	31.80	78.	7.45	33.50
22.	8.08	31.86	80.	7.46	33.54
22.	8.02	31.86	82.	7.42	33.58
24.	7.91	31.94	84.	7.42	33.61
26.	7.73	32.03	84.	7.31	33.61
28.	7.64	32.10	86.	7.31	33.65
31.	7.36	32.36	86.	7.12	33.65
32.	7.35	32.40	88.	7.07	33.68
34.	7.11	32.46	91.	6.93	33.73
36.	7.07	32.60	94.	6.80	33.78
42.	7.09	32.72	96.	6.80	33.81
44.	7.20	32.76	96.	6.77	33.81
46.	7.21	32.82	100.	6.75	33.82
48.	7.32	32.96	114.	6.74	33.82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1200
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PRESSURE, DB
REF. NO. 71 - 4 - 3
48-42.0 N 126-40.0 W
MO.-5 DAY-15 GMT-4.7
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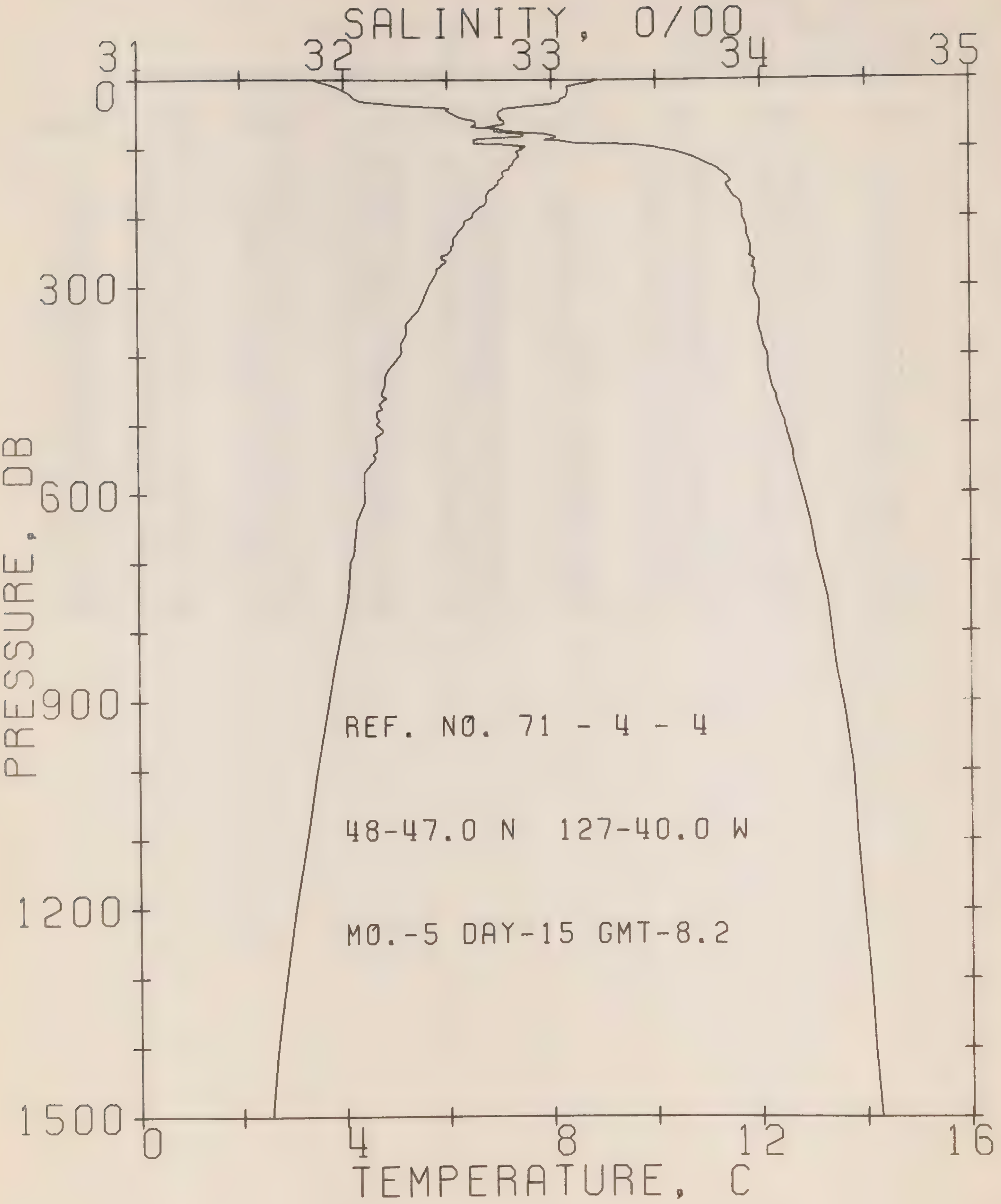
12
16
TEMPERATURE, C

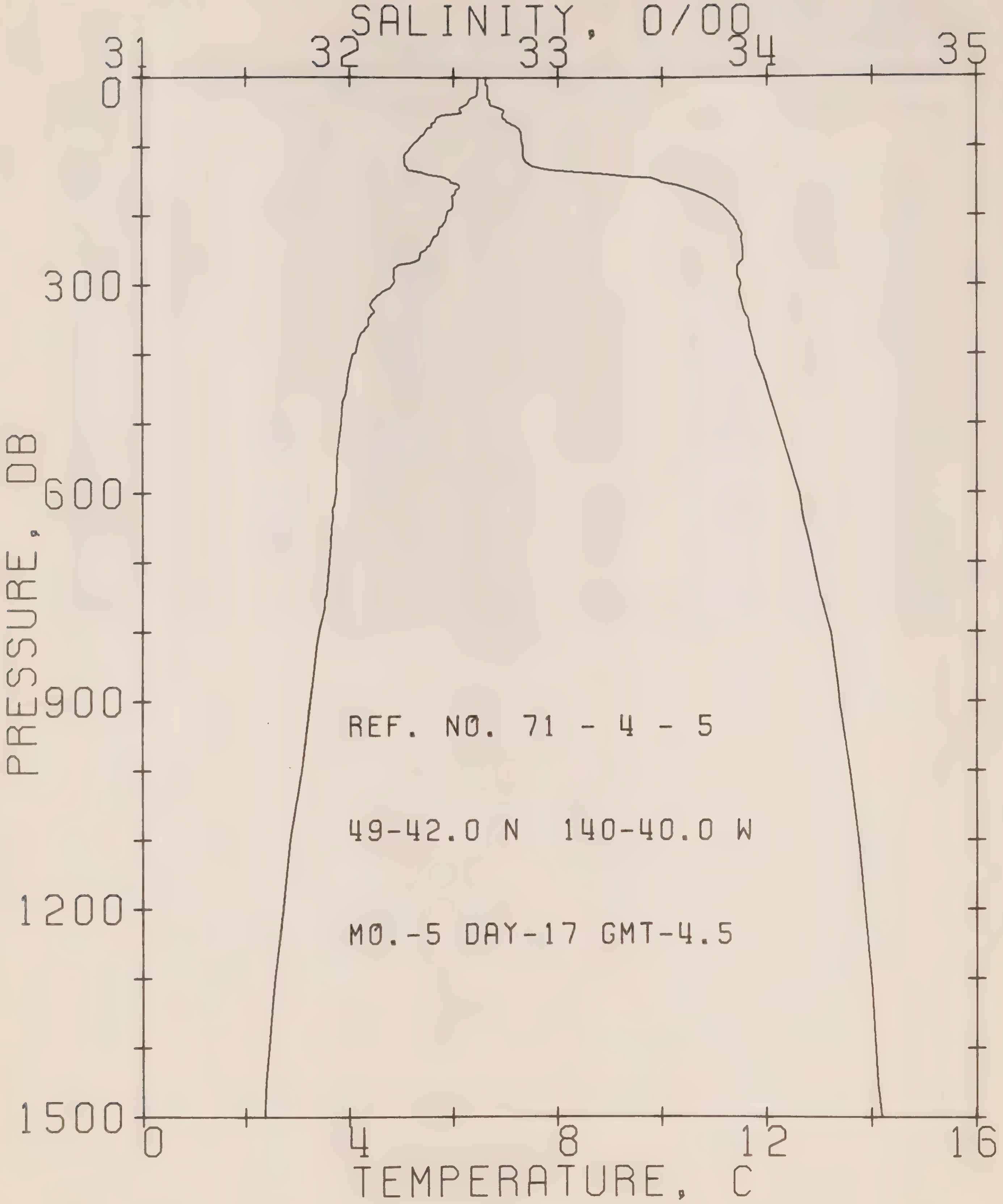
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 3 DATE 15/ 5/71
POSITION 48-42.0N, 126-40.0W GMT 4.7
RESULTS OF STP CAST 117 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.71	31.34	0	24.17	375.7	0.0	0.0	1485.
10	9.37	31.40	10	24.27	366.5	0.37	0.02	1484.
20	9.43	31.70	20	24.50	345.3	0.73	0.07	1484.
30	8.83	31.95	30	24.78	318.0	1.06	0.16	1483.
50	7.67	32.53	50	25.41	258.8	1.63	0.39	1479.
75	7.43	32.88	75	25.72	230.0	2.24	0.77	1479.
100	7.62	33.60	99	26.26	178.9	2.75	1.22	1481.
125	7.14	33.76	124	26.45	161.2	3.18	1.71	1480.
150	6.86	33.84	149	26.55	152.0	3.56	2.25	1479.
175	6.54	33.86	174	26.61	146.6	3.94	2.87	1479.
200	6.18	33.88	199	26.67	140.9	4.30	3.56	1478.
225	5.97	33.90	223	26.71	137.2	4.64	4.31	1477.
250	5.80	33.91	248	26.74	134.5	4.98	5.13	1477.
300	5.46	33.96	298	26.82	127.4	5.64	6.97	1476.
400	4.79	34.03	397	26.96	115.2	6.85	11.27	1475.
500	4.58	34.13	496	27.06	106.2	7.96	16.36	1476.
600	4.28	34.22	595	27.16	97.3	8.98	22.08	1477.
800	4.01	34.35	793	27.29	86.1	10.81	35.08	1479.
1000	3.52	34.43	991	27.41	76.1	12.43	49.88	1480.
1200	3.15	34.49	1188	27.49	69.0	13.87	66.09	1482.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 4
48-47.0 N 127-40.0 W
MO.-5 DAY-15 GMT-8.2
0
4
8
12
16
TEMPERATURE, C

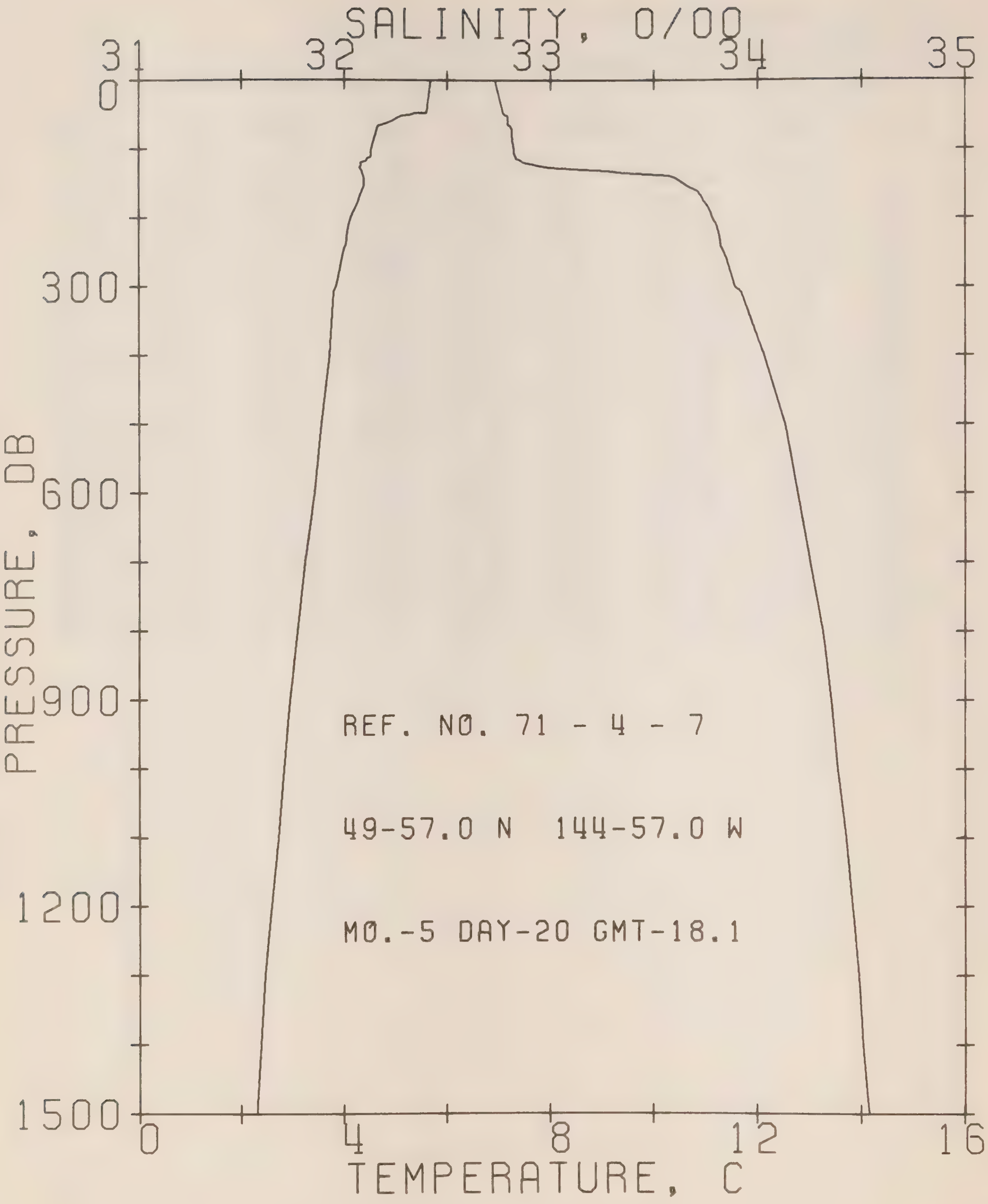
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 4 DATE 15/ 5/71
POSITION 48-47.0N, 127-40.0W GMT 8.2
RESULTS OF STP CAST 125 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.94	31.86	0	24.70	325.6	0.0	0.0	1482.
10	8.33	31.96	10	24.87	309.8	0.32	0.02	1480.
20	8.34	32.03	20	24.92	304.8	0.63	0.06	1481.
30	8.20	32.07	30	24.98	299.7	0.93	0.14	1480.
50	6.99	32.53	50	25.51	249.5	1.47	0.36	1477.
75	6.91	32.80	75	25.72	229.1	2.07	0.74	1477.
100	7.44	33.52	99	26.22	182.5	2.59	1.20	1480.
125	7.25	33.77	124	26.44	162.0	3.02	1.69	1480.
150	6.99	33.85	149	26.54	152.6	3.41	2.23	1480.
175	6.78	33.90	174	26.61	146.6	3.78	2.86	1480.
200	6.50	33.92	199	26.66	142.0	4.14	3.54	1479.
225	6.20	33.94	223	26.72	136.9	4.49	4.29	1478.
250	6.07	33.96	248	26.75	134.2	4.82	5.11	1478.
300	5.65	33.97	298	26.81	128.8	5.48	6.94	1477.
400	5.10	34.04	397	26.93	118.2	6.71	11.33	1477.
500	4.61	34.12	496	27.05	107.5	7.84	16.49	1476.
600	4.39	34.21	595	27.14	99.5	8.88	22.30	1477.
800	3.93	34.34	793	27.29	86.1	10.72	35.41	1479.
1000	3.46	34.44	991	27.42	74.8	12.33	50.11	1480.
1200	3.03	34.49	1188	27.50	67.7	13.76	66.11	1482.
1500	2.53	34.57	1484	27.61	57.7	15.63	91.81	1485.


SALINITY, O/OO
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 5
49-42.0 N 140-40.0 W
MO.-5 DAY-17 GMT-4.5
0
4
8
12
16
TEMPERATURE, C

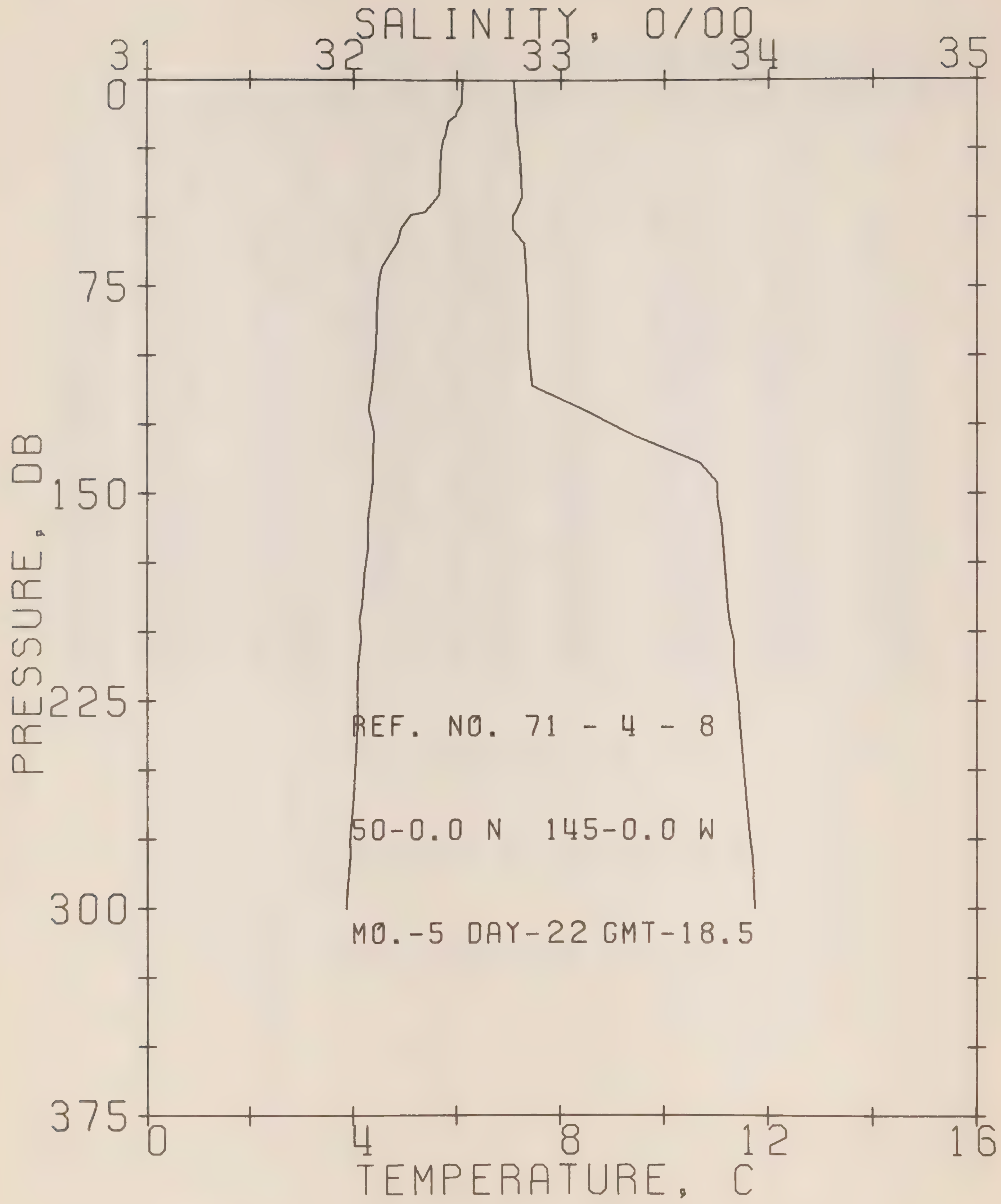
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 5 DATE 17/ 5/71
POSITION 49-42.0N, 140-40.0W GMT 4.5
RESULTS OF STP CAST 108 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.49	32.66	0	25.67	233.0	0.0	0.0	1474.
10	6.49	32.66	10	25.67	233.4	0.23	0.01	1474.
20	6.48	32.67	20	25.68	232.7	0.47	0.05	1474.
30	6.38	32.67	30	25.69	231.5	0.70	0.11	1474.
50	6.16	32.74	50	25.78	223.5	1.15	0.29	1474.
75	5.52	32.82	75	25.92	210.5	1.70	0.64	1471.
100	5.21	32.84	99	25.97	206.0	2.22	1.10	1471.
125	5.06	32.87	124	26.01	202.5	2.73	1.69	1470.
150	5.93	33.49	149	26.40	165.9	3.19	2.34	1475.
175	5.99	33.74	174	26.58	148.7	3.59	2.99	1476.
200	5.90	33.84	199	26.67	140.4	3.95	3.67	1476.
225	5.73	33.89	223	26.73	135.3	4.29	4.42	1476.
250	5.48	33.89	248	26.76	132.2	4.63	5.23	1476.
300	4.85	33.88	298	26.83	126.2	5.27	7.03	1474.
400	4.08	33.95	397	26.97	113.4	6.46	11.28	1472.
500	3.85	34.06	496	27.08	103.5	7.54	16.23	1473.
600	3.76	34.16	595	27.17	95.9	8.54	21.80	1475.
800	3.43	34.31	793	27.32	82.7	10.34	34.60	1477.
1000	3.09	34.40	990	27.42	73.7	11.91	48.93	1479.
1200	2.73	34.47	1188	27.51	65.7	13.29	64.43	1480.
1500	2.35	34.55	1484	27.61	57.1	15.13	89.64	1484.


SALINITY, O/OO
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 7
49-57.0 N 144-57.0 W
MO.-5 DAY-20 GMT-18.1
0
4
8
12
16
TEMPERATURE, C

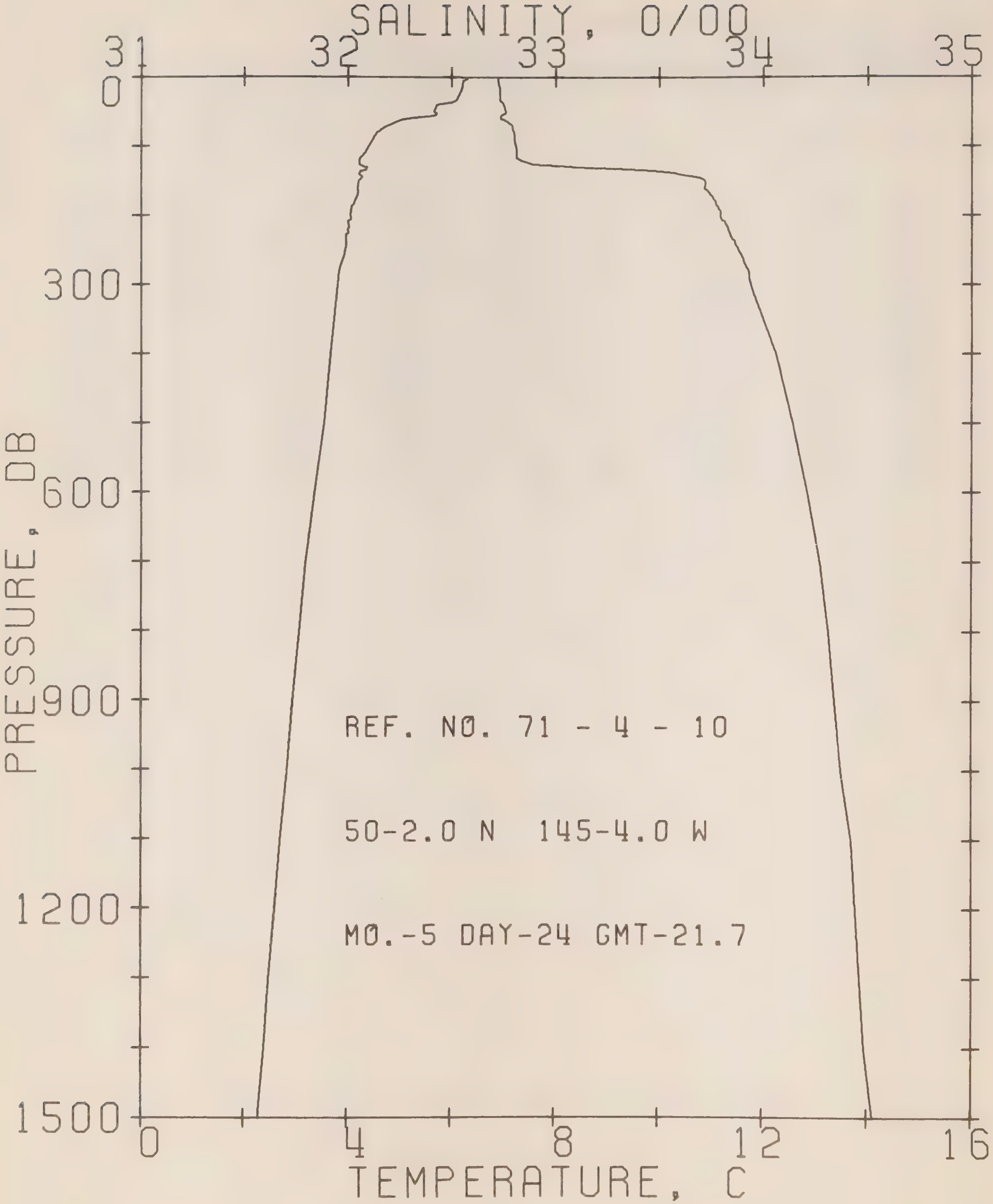
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 7 DATE 20 / 5/71
POSITION 49-57.0N, 144-57.0W GMT 18.1
RESULTS OF STP CAST 53 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	5.71	32.74	0	25.83	217.9	0.0	0.0	1471.
10	5.69	32.75	10	25.84	217.4	0.22	0.01	1471.
20	5.68	32.76	20	25.85	216.7	0.43	0.04	1471.
30	5.66	32.76	30	25.85	216.0	0.65	0.10	1471.
50	5.33	32.79	50	25.91	210.9	1.08	0.27	1470.
75	4.65	32.82	75	26.01	201.3	1.59	0.60	1468.
100	4.55	32.83	99	26.03	199.7	2.09	1.05	1468.
125	4.33	32.96	124	26.16	187.9	2.59	1.61	1468.
150	4.40	33.65	149	26.70	137.0	2.97	2.15	1469.
175	4.29	33.75	174	26.79	128.8	3.30	2.70	1469.
200	4.15	33.79	199	26.83	124.4	3.62	3.30	1469.
225	4.07	33.82	223	26.87	121.4	3.92	3.96	1469.
250	4.00	33.85	248	26.89	119.1	4.23	4.69	1469.
300	3.87	33.90	298	26.95	114.1	4.81	6.32	1470.
400	3.73	34.04	397	27.08	103.0	5.88	10.14	1471.
500	3.58	34.14	496	27.17	94.7	6.87	14.65	1472.
600	3.44	34.20	595	27.23	89.5	7.79	19.81	1473.
800	3.11	34.32	793	27.36	78.5	9.47	31.72	1475.
1000	2.84	34.39	990	27.44	71.7	10.97	45.41	1477.
1200	2.60	34.46	1188	27.51	65.1	12.33	60.68	1480.
1500	2.30	34.54	1483	27.60	57.3	14.16	85.81	1484.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 8
50-0.0 N 145-0.0 W
MO.-5 DAY-22 GMT-18.5
0
4
8
12
16
TEMPERATURE, C

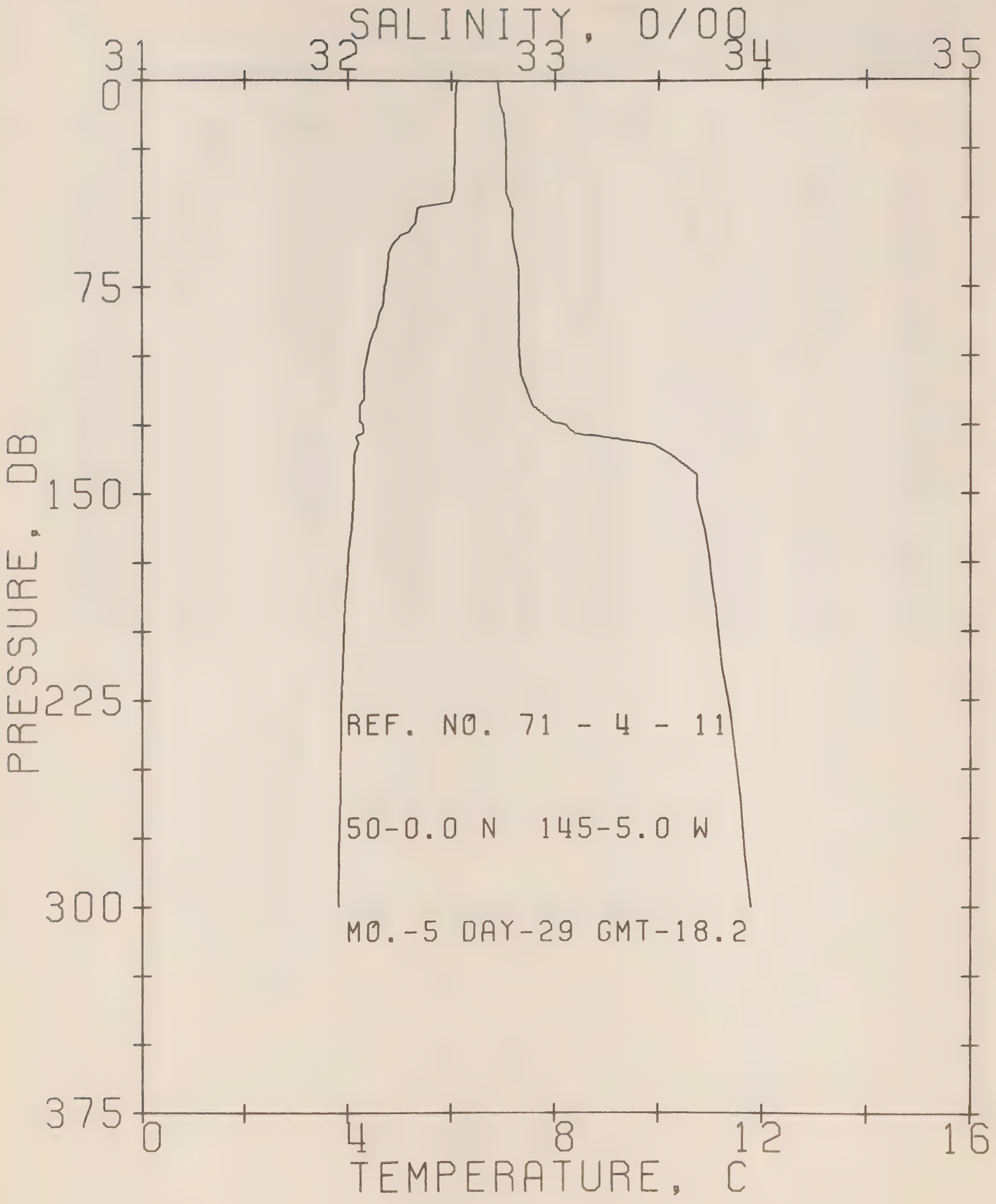
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 8 DATE 22/ 5/71
POSITION 50- 0.0N, 145- 0.0W GMT 18.5
RESULTS OF STP CAST 37 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.14	32.78	0	25.81	219.9	0.0	0.0	1473.
10	6.08	32.79	10	25.82	218.8	0.22	0.01	1473.
20	5.81	32.80	20	25.86	215.0	0.44	0.04	1472.
30	5.71	32.81	30	25.89	213.0	0.65	0.10	1471.
50	5.11	32.77	50	25.92	209.7	1.07	0.27	1469.
75	4.50	32.84	75	26.05	198.1	1.58	0.59	1467.
100	4.43	32.85	99	26.06	196.7	2.07	1.03	1467.
125	4.36	33.26	124	26.39	165.9	2.54	1.57	1468.
150	4.36	33.76	149	26.79	128.5	2.90	2.06	1469.
175	4.26	33.80	174	26.83	124.9	3.21	2.59	1469.
200	4.14	33.83	199	26.87	121.2	3.52	3.17	1469.
225	4.10	33.86	223	26.90	118.7	3.82	3.82	1469.
250	4.04	33.89	248	26.92	116.3	4.11	4.54	1470.
300	3.85	33.94	298	26.98	110.9	4.68	6.12	1470.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 10
50-2.0 N 145-4.0 W
MO.-5 DAY-24 GMT-21.7
0
4
8
12
16
TEMPERATURE, C

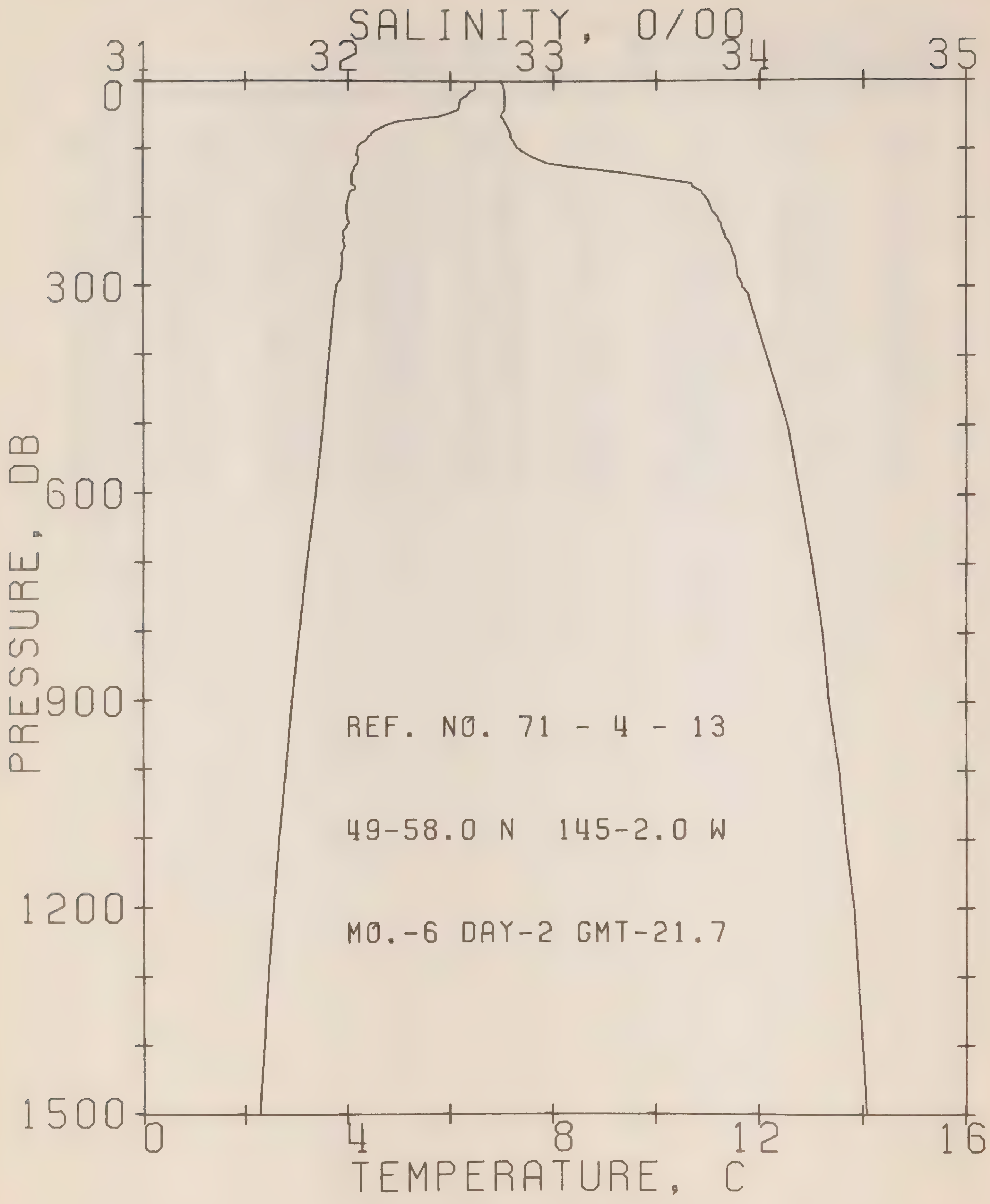
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 10 DATE 24/ 5/71
POSITION 50- 2.0N, 145- 4.0W GMT 21.7
RESULTS OF STP CAST 73 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.33	32.73	0	25.74	225.9	0.0	0.0	1473.
10	6.25	32.74	10	25.76	224.7	0.23	0.01	1473.
20	6.21	32.74	20	25.77	224.1	0.45	0.05	1473.
30	6.15	32.74	30	25.78	223.5	0.67	0.10	1473.
50	5.68	32.77	50	25.86	216.0	1.11	0.28	1472.
75	4.69	32.80	75	26.00	203.0	1.64	0.62	1468.
100	4.43	32.82	99	26.04	199.2	2.14	1.06	1467.
125	4.23	32.89	124	26.11	192.1	2.63	1.63	1467.
150	4.23	33.73	149	26.78	129.3	3.01	2.15	1469.
175	4.18	33.77	174	26.81	126.1	3.33	2.69	1469.
200	4.07	33.80	199	26.85	122.8	3.64	3.28	1469.
225	4.03	33.85	223	26.89	119.0	3.95	3.93	1469.
250	3.97	33.89	248	26.93	115.4	4.24	4.64	1469.
300	3.83	33.95	298	26.99	110.0	4.80	6.21	1470.
400	3.70	34.07	397	27.10	100.4	5.85	9.95	1471.
500	3.57	34.15	496	27.18	93.9	6.82	14.39	1472.
600	3.39	34.22	595	27.25	87.5	7.73	19.45	1473.
800	3.10	34.32	793	27.36	78.4	9.38	31.17	1475.
1000	2.85	34.38	990	27.43	72.5	10.89	44.97	1478.
1200	2.61	34.45	1188	27.51	65.9	12.26	60.32	1480.
1500	2.27	34.53	1483	27.60	57.7	14.13	85.98	1483.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 11
50-0.0 N 145-5.0 W
MO.-5 DAY-29 GMT-18.2
0
4
8
12
16
TEMPERATURE, C

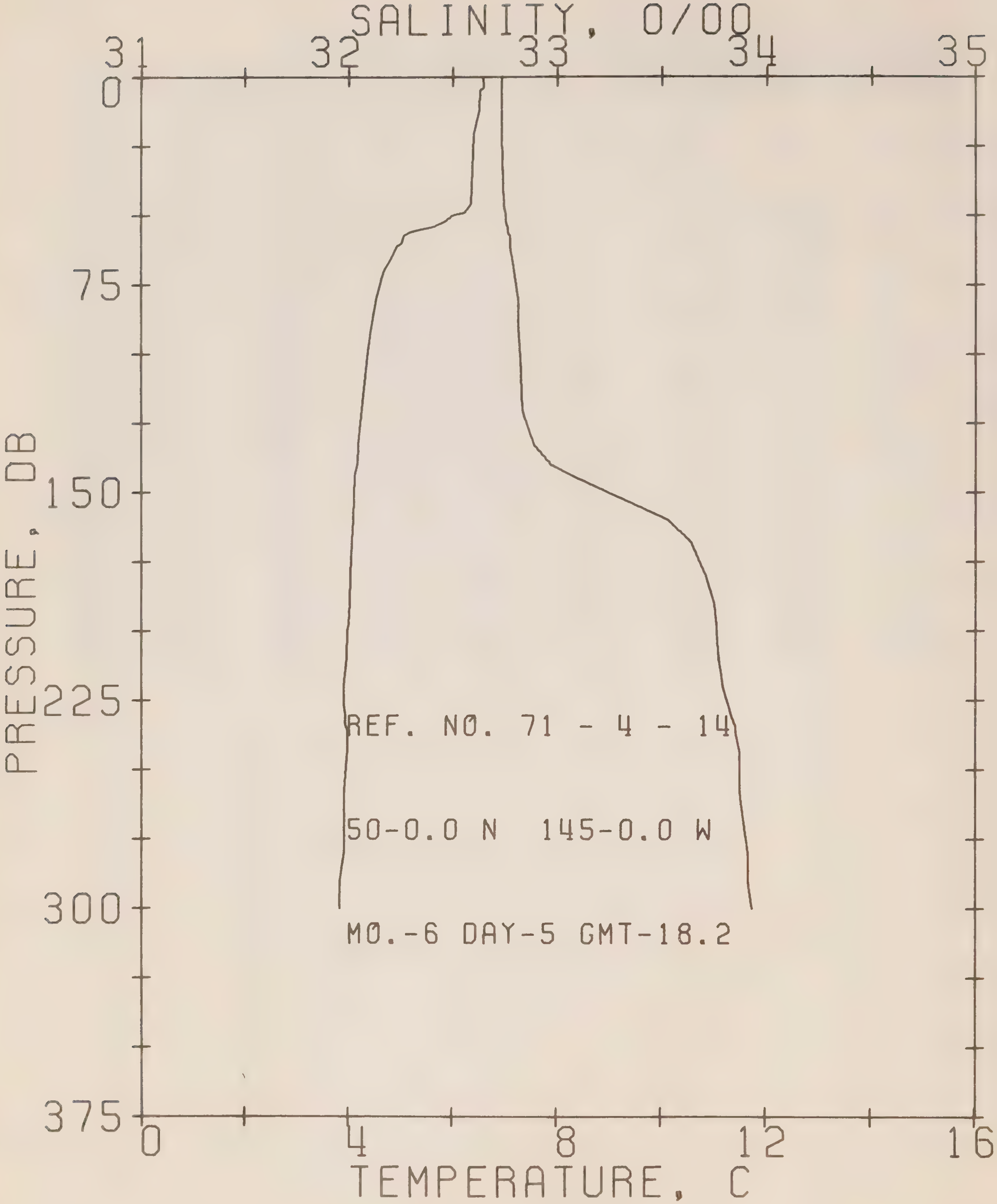
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 11 DATE 29/ 5/71
POSITION 50- 0.0N, 145- 5.0W GMT 18.2
RESULTS OF STP CAST 44 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.13	32.73	0	25.77	223.5	0.0	0.0	1473.
10	6.11	32.75	10	25.79	222.1	0.22	0.01	1473.
20	6.10	32.77	20	25.80	220.8	0.44	0.05	1473.
30	6.09	32.77	30	25.81	220.6	0.66	0.10	1473.
50	5.34	32.80	50	25.92	210.0	1.10	0.28	1470.
75	4.72	32.83	75	26.01	201.3	1.61	0.60	1468.
100	4.39	32.83	99	26.05	197.7	2.11	1.05	1467.
125	4.29	33.06	124	26.24	180.1	2.59	1.60	1468.
150	4.12	33.69	149	26.76	131.2	2.96	2.11	1468.
175	4.01	33.75	174	26.82	125.5	3.28	2.64	1468.
200	3.93	33.79	199	26.86	121.9	3.59	3.23	1468.
225	3.88	33.84	223	26.90	117.9	3.89	3.88	1468.
250	3.86	33.88	248	26.94	114.7	4.18	4.58	1469.
300	3.80	33.95	298	27.00	109.7	4.74	6.15	1469.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 13
49-58.0 N 145-2.0 W
MO.-6 DAY-2 GMT-21.7
0
4
8
12
16
TEMPERATURE, C

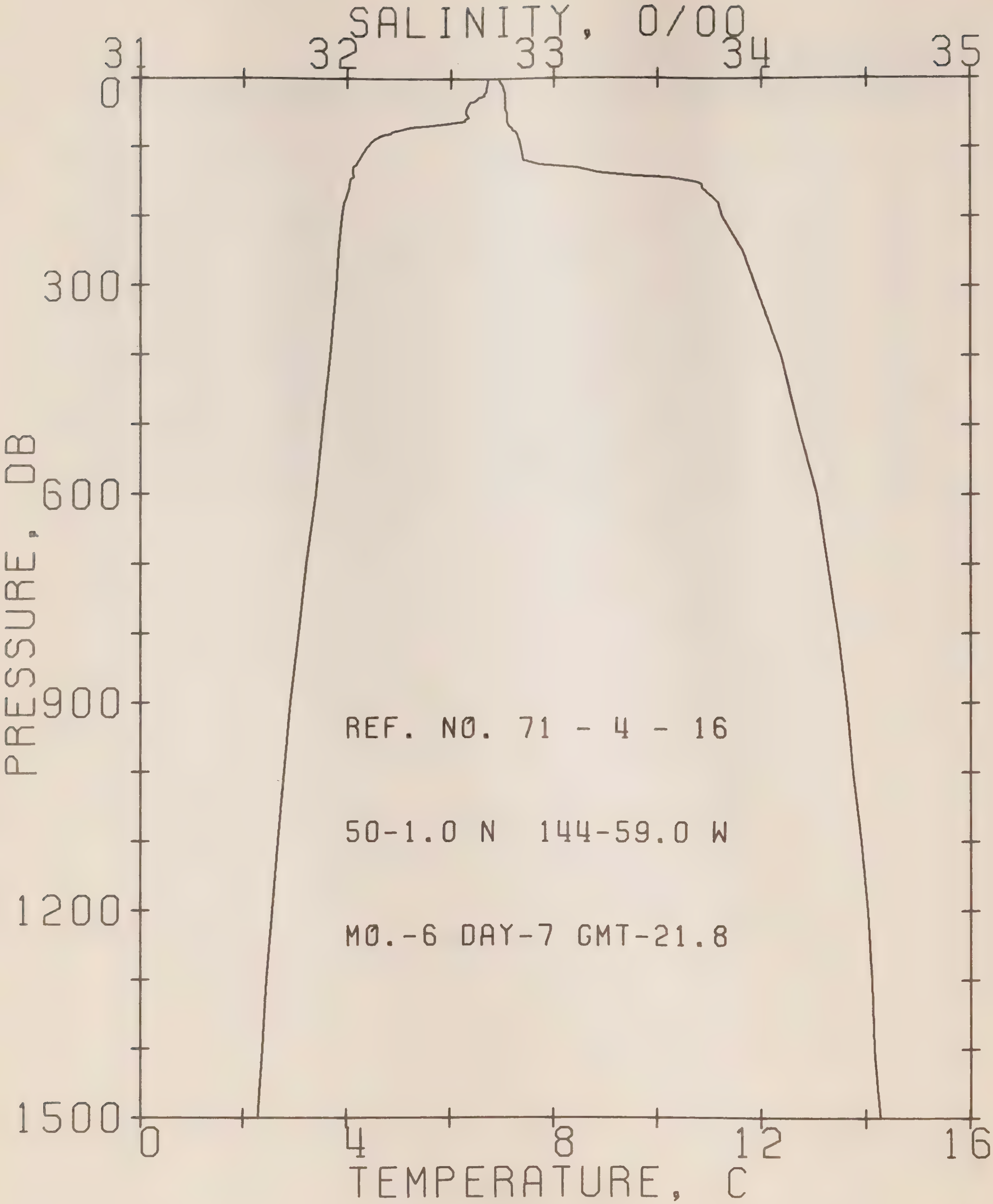
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 13 DATE 2/ 6/71
POSITION 49-58.0N, 145- 2.0W GMT 21.7
RESULTS OF STP CAST 63 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.51	32.75	0	25.74	226.6	0.0	0.0	1474.
10	6.50	32.77	10	25.75	225.6	0.23	0.01	1474.
20	6.37	32.77	20	25.77	223.9	0.45	0.05	1474.
30	6.22	32.77	30	25.79	222.1	0.67	0.10	1473.
50	5.88	32.75	50	25.82	219.8	1.12	0.28	1472.
75	4.49	32.80	75	26.01	201.1	1.64	0.61	1467.
100	4.22	32.85	99	26.08	195.2	2.13	1.06	1467.
125	4.16	33.09	124	26.28	176.4	2.61	1.60	1467.
150	4.10	33.68	149	26.75	131.7	2.99	2.13	1468.
175	4.02	33.76	174	26.82	125.1	3.31	2.66	1468.
200	4.02	33.81	199	26.86	121.9	3.62	3.25	1469.
225	3.94	33.84	223	26.90	118.7	3.92	3.90	1469.
250	3.91	33.88	248	26.93	115.7	4.21	4.61	1469.
300	3.80	33.92	298	26.97	111.9	4.78	6.21	1469.
400	3.66	34.04	397	27.08	102.3	5.85	9.99	1471.
500	3.53	34.14	496	27.17	94.2	6.83	14.47	1472.
600	3.39	34.20	595	27.24	89.0	7.74	19.59	1473.
800	3.07	34.31	793	27.35	78.8	9.42	31.48	1475.
1000	2.80	34.39	990	27.44	71.2	10.92	45.26	1477.
1200	2.56	34.46	1188	27.52	64.6	12.28	60.48	1480.
1500	2.27	34.52	1483	27.59	58.4	14.13	85.80	1483.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 14
50-0.0 N 145-0.0 W
MO.-6 DAY-5 GMT-18.2
0
4
8
12
16
TEMPERATURE, C

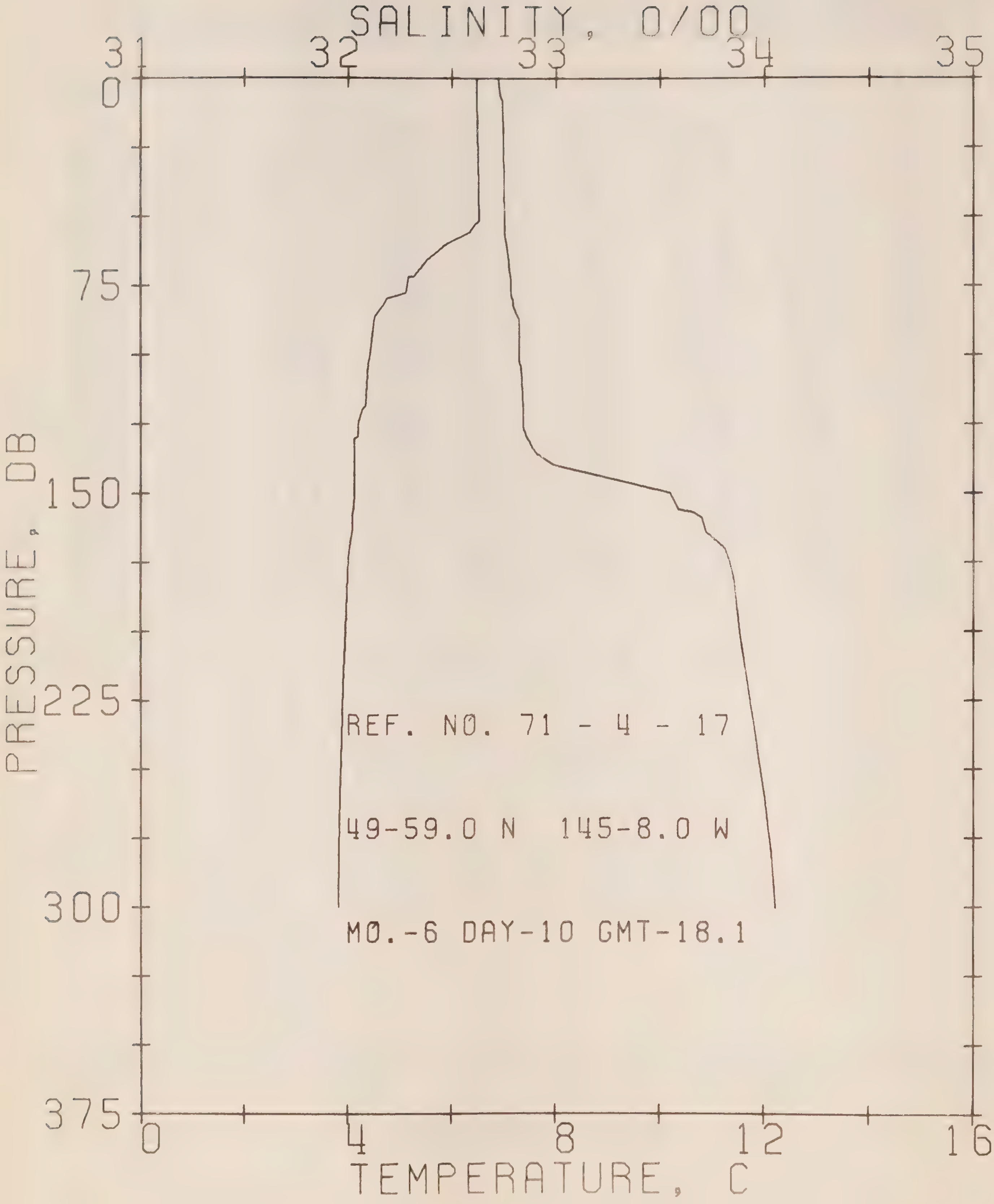
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 14 DATE 5/ 6/71
POSITION 50- 0.0N, 145- 0.0W GMT 18.2
RESULTS OF STP CAST 41 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.60	32.74	0	25.72	228.4	0.0	0.0	1474.
10	6.53	32.74	10	25.73	227.9	0.23	0.01	1474.
20	6.44	32.74	20	25.74	227.0	0.46	0.05	1474.
30	6.41	32.74	30	25.75	226.4	0.68	0.10	1474.
50	6.01	32.76	50	25.81	220.7	1.13	0.29	1473.
75	4.62	32.81	75	26.01	201.8	1.65	0.62	1468.
100	4.39	32.83	99	26.05	198.1	2.15	1.06	1467.
125	4.24	32.86	124	26.09	194.3	2.65	1.63	1467.
150	4.13	33.25	149	26.41	164.1	3.11	2.27	1467.
175	4.06	33.69	174	26.76	130.7	3.46	2.86	1468.
200	3.99	33.77	199	26.83	124.3	3.78	3.46	1468.
225	3.91	33.82	223	26.88	119.8	4.09	4.13	1469.
250	3.96	33.88	248	26.93	116.1	4.38	4.84	1469.
300	3.82	33.94	298	26.99	110.6	4.95	6.43	1470.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 16
50-1.0 N 144-59.0 W
MO.-6 DAY-7 GMT-21.8
0
4
8
12
16
TEMPERATURE, C

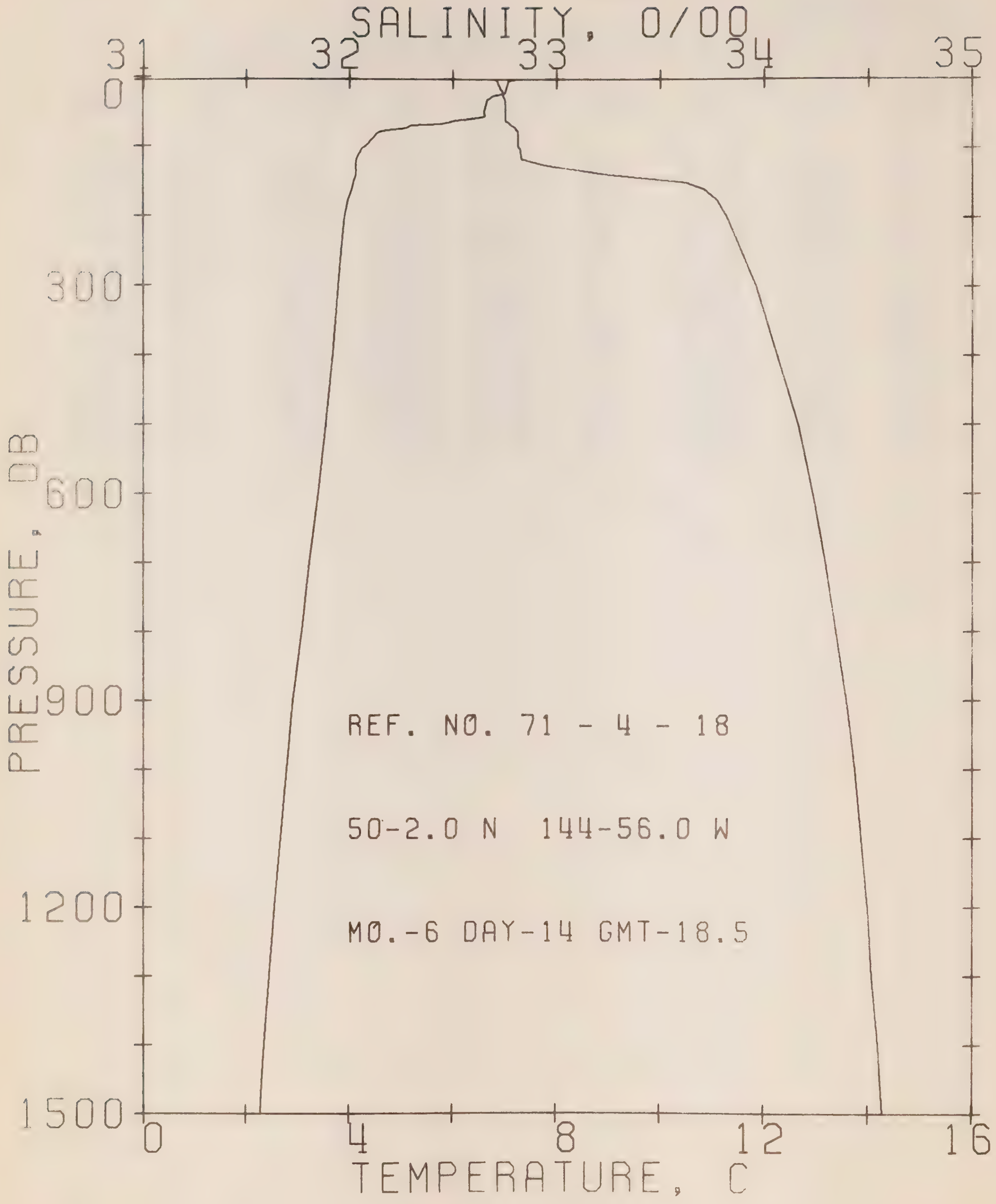
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 16 DATE 7/ 6/71
POSITION 50- 1.0N, 144-59.0W GMT 21.8
RESULTS OF STP CAST 50 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.74	32.74	0	25.70	230.1	0.0	0.0	1475.
10	6.73	32.76	10	25.72	228.9	0.23	0.01	1475.
20	6.71	32.77	20	25.73	228.1	0.46	0.05	1475.
30	6.54	32.77	30	25.75	226.0	0.69	0.10	1475.
50	6.31	32.78	50	25.79	222.7	1.13	0.29	1474.
75	5.05	32.81	75	25.96	206.3	1.68	0.63	1470.
100	4.40	32.85	99	26.06	196.7	2.18	1.08	1467.
125	4.20	32.94	124	26.15	188.2	2.67	1.64	1467.
150	4.08	33.69	149	26.76	130.8	3.07	2.19	1468.
175	3.99	33.78	174	26.84	123.1	3.38	2.72	1468.
200	3.92	33.82	199	26.88	119.8	3.68	3.30	1468.
225	3.88	33.87	223	26.92	115.9	3.98	3.93	1469.
250	3.85	33.92	248	26.97	112.0	4.26	4.62	1469.
300	3.82	33.98	298	27.02	107.6	4.81	6.16	1470.
400	3.69	34.10	397	27.13	98.1	5.84	9.80	1471.
500	3.55	34.18	496	27.20	91.4	6.79	14.13	1472.
600	3.41	34.27	595	27.29	84.0	7.67	19.03	1473.
800	3.08	34.37	793	27.40	74.5	9.25	30.28	1475.
1000	2.80	34.44	990	27.48	67.6	10.67	43.22	1477.
1200	2.57	34.51	1188	27.56	61.0	11.95	57.56	1480.
1500	2.27	34.57	1483	27.63	54.7	13.69	81.50	1484.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 17
49-59.0 N 145-8.0 W
MO.-6 DAY-10 GMT-18.1
0
4
8
12
16
TEMPERATURE, C

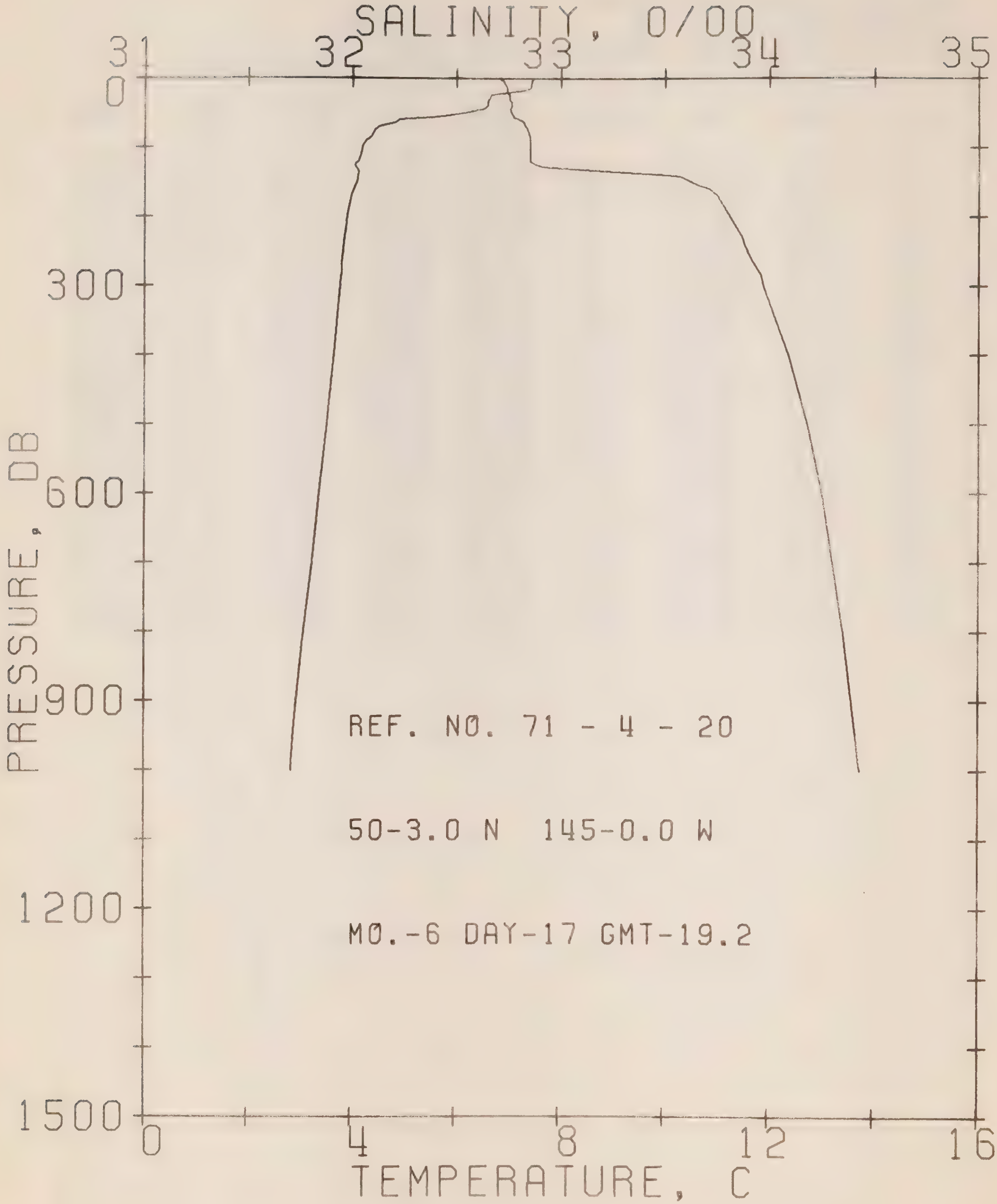
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 17 DATE 10/ 6/71
POSITION 49-59.0N, 145- 8.0W GMT 18.1
RESULTS OF STP CAST 39 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.49	32.73	0	25.72	227.9	0.0	0.0	1474.
10	6.49	32.75	10	25.74	226.7	0.23	0.01	1474.
20	6.51	32.75	20	25.74	226.8	0.45	0.05	1474.
30	6.52	32.75	30	25.74	226.9	0.68	0.10	1475.
50	6.55	32.76	50	25.74	227.2	1.13	0.29	1475.
75	5.16	32.79	75	25.93	209.0	1.68	0.64	1470.
100	4.44	32.83	99	26.04	198.6	2.18	1.08	1467.
125	4.21	32.85	124	26.08	195.0	2.68	1.65	1467.
150	4.13	33.56	149	26.65	141.0	3.12	2.27	1468.
175	4.02	33.84	174	26.89	118.8	3.45	2.81	1468.
200	3.96	33.89	199	26.93	114.9	3.74	3.36	1468.
225	3.90	33.94	223	26.98	110.9	4.02	3.97	1469.
250	3.86	33.99	248	27.02	106.9	4.29	4.63	1469.
300	3.80	34.06	298	27.08	101.4	4.81	6.08	1470.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 18
50-2.0 N 144-56.0 W
MO.-6 DAY-14 GMT-18.5
0
4
8
12
16
TEMPERATURE, C

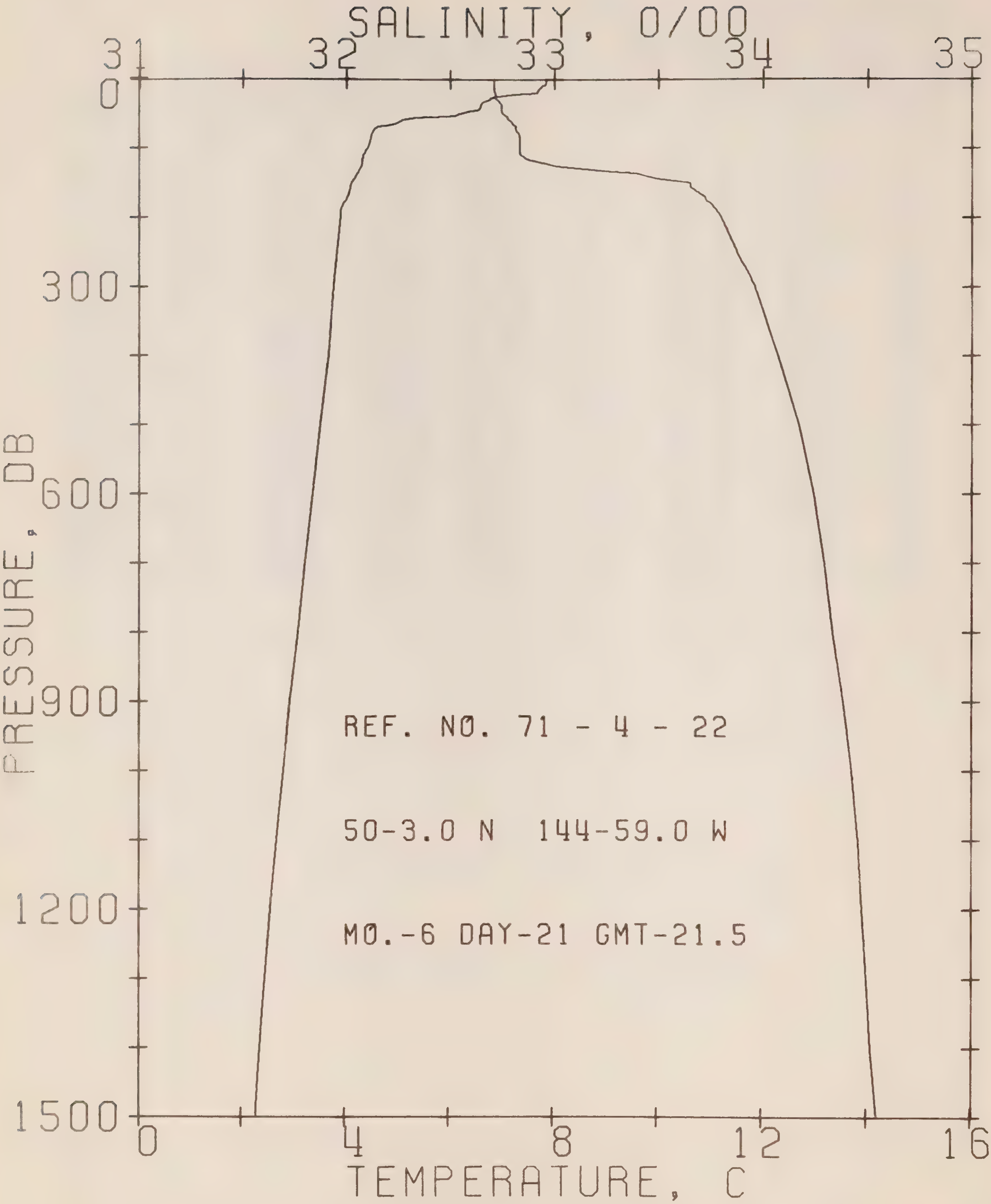
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 18 DATE 14/ 6/71
POSITION 50- 2.0N, 144-56.0W GMT 18.5
RESULTS OF STP CAST 40 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.28	32.70	0	25.60	240.1	0.0	0.0	1477.
10	7.08	32.73	10	25.65	235.6	0.24	0.01	1477.
20	7.04	32.75	20	25.67	233.7	0.47	0.05	1477.
30	6.69	32.76	30	25.72	228.6	0.70	0.11	1475.
50	6.61	32.76	50	25.73	227.9	1.16	0.29	1475.
75	4.65	32.82	75	26.01	201.3	1.70	0.64	1468.
100	4.27	32.83	99	26.06	196.9	2.20	1.08	1467.
125	4.13	32.95	124	26.17	186.7	2.69	1.64	1467.
150	4.10	33.63	149	26.71	135.5	3.10	2.21	1468.
175	3.99	33.78	174	26.84	123.3	3.42	2.74	1468.
200	3.92	33.83	199	26.89	119.1	3.72	3.32	1468.
225	3.88	33.86	223	26.92	116.3	4.01	3.95	1469.
250	3.85	33.90	248	26.95	113.5	4.30	4.65	1469.
300	3.80	33.97	298	27.01	108.2	4.85	6.20	1470.
400	3.70	34.07	397	27.10	100.4	5.90	9.90	1471.
500	3.56	34.17	496	27.20	92.3	6.86	14.30	1472.
600	3.42	34.24	595	27.26	86.4	7.75	19.29	1473.
800	3.10	34.35	793	27.38	76.1	9.37	30.79	1475.
1000	2.80	34.44	990	27.48	67.6	10.80	43.87	1477.
1200	2.56	34.50	1188	27.55	61.6	12.09	58.31	1480.
1500	2.25	34.57	1483	27.63	54.6	13.84	82.21	1483.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 20
50-3.0 N 145-0.0 W
MO.-6 DAY-17 GMT-19.2
0
4
8
12
16
TEMPERATURE, C

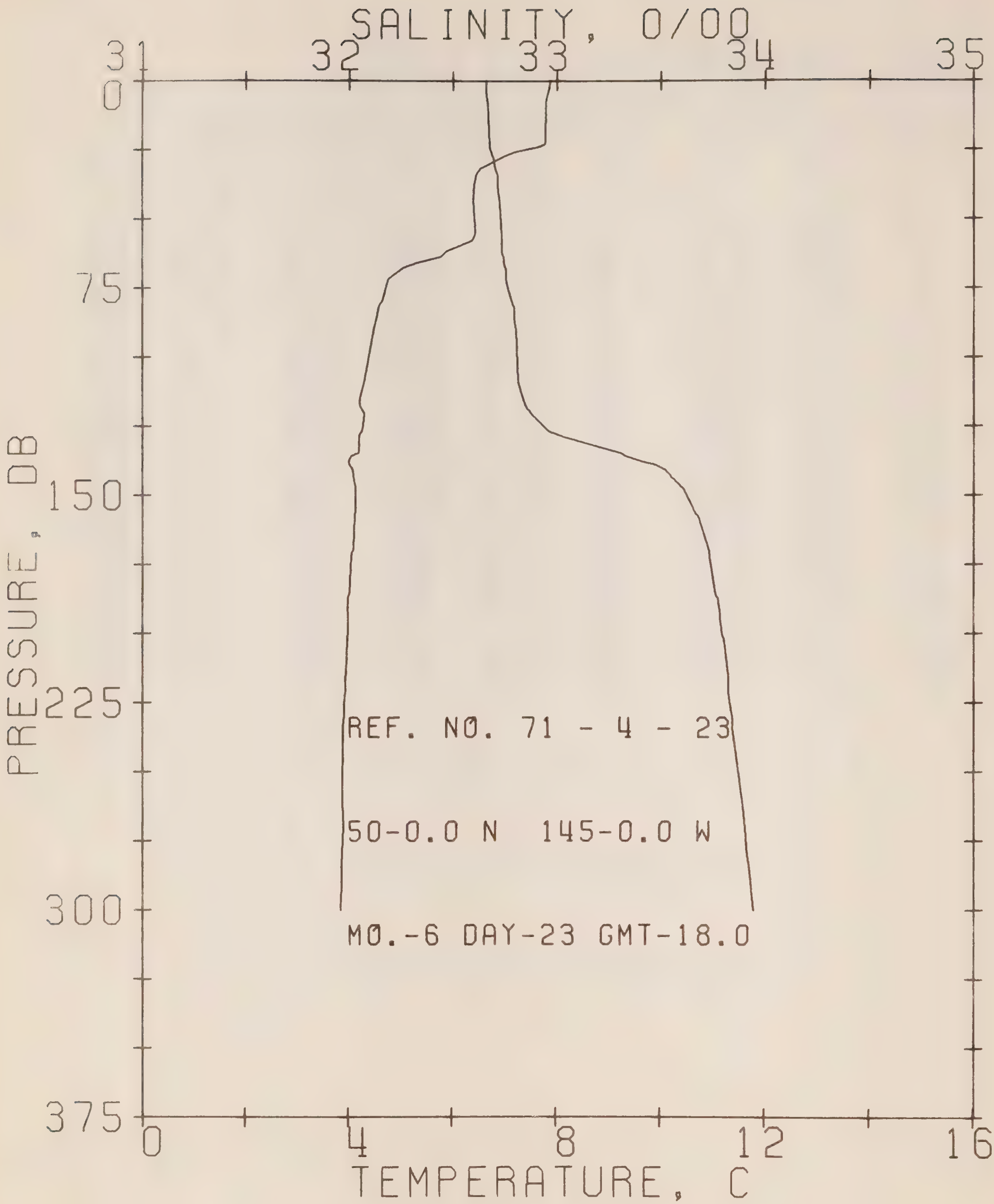
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 20 DATE 17/ 6/71
POSITION 50- 3.0N, 145- 0.0W GMT 19.2
RESULTS OF STP CAST 51 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.48	32.71	0	25.58	241.9	0.0	0.0	1478.
10	7.47	32.74	10	25.60	239.7	0.24	0.01	1478.
20	7.12	32.75	20	25.66	234.7	0.48	0.05	1477.
30	6.66	32.76	30	25.73	228.3	0.71	0.11	1475.
50	6.21	32.77	50	25.79	222.2	1.16	0.29	1474.
75	4.45	32.85	75	26.06	197.0	1.68	0.62	1467.
100	4.22	32.86	99	26.09	194.1	2.17	1.05	1467.
125	4.06	32.89	124	26.13	190.6	2.65	1.61	1466.
150	4.11	33.63	149	26.71	135.4	3.05	2.16	1468.
175	3.98	33.77	174	26.83	124.0	3.37	2.69	1468.
200	3.92	33.82	199	26.88	119.8	3.67	3.27	1468.
225	3.88	33.87	223	26.92	115.9	3.97	3.91	1468.
250	3.84	33.90	248	26.96	113.1	4.25	4.60	1469.
300	3.79	33.98	298	27.02	107.3	4.80	6.14	1469.
400	3.67	34.10	397	27.13	97.9	5.83	9.78	1471.
500	3.54	34.19	496	27.21	90.6	6.77	14.08	1472.
600	3.39	34.26	595	27.28	84.5	7.65	18.97	1473.
800	3.10	34.36	793	27.39	75.4	9.25	30.34	1475.
1000	2.83	34.44	990	27.48	67.8	10.68	43.43	1478.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 22
50-3.0 N 144-59.0 W
MO.-6 DAY-21 GMT-21.5
0
4
8
12
16
TEMPERATURE, C

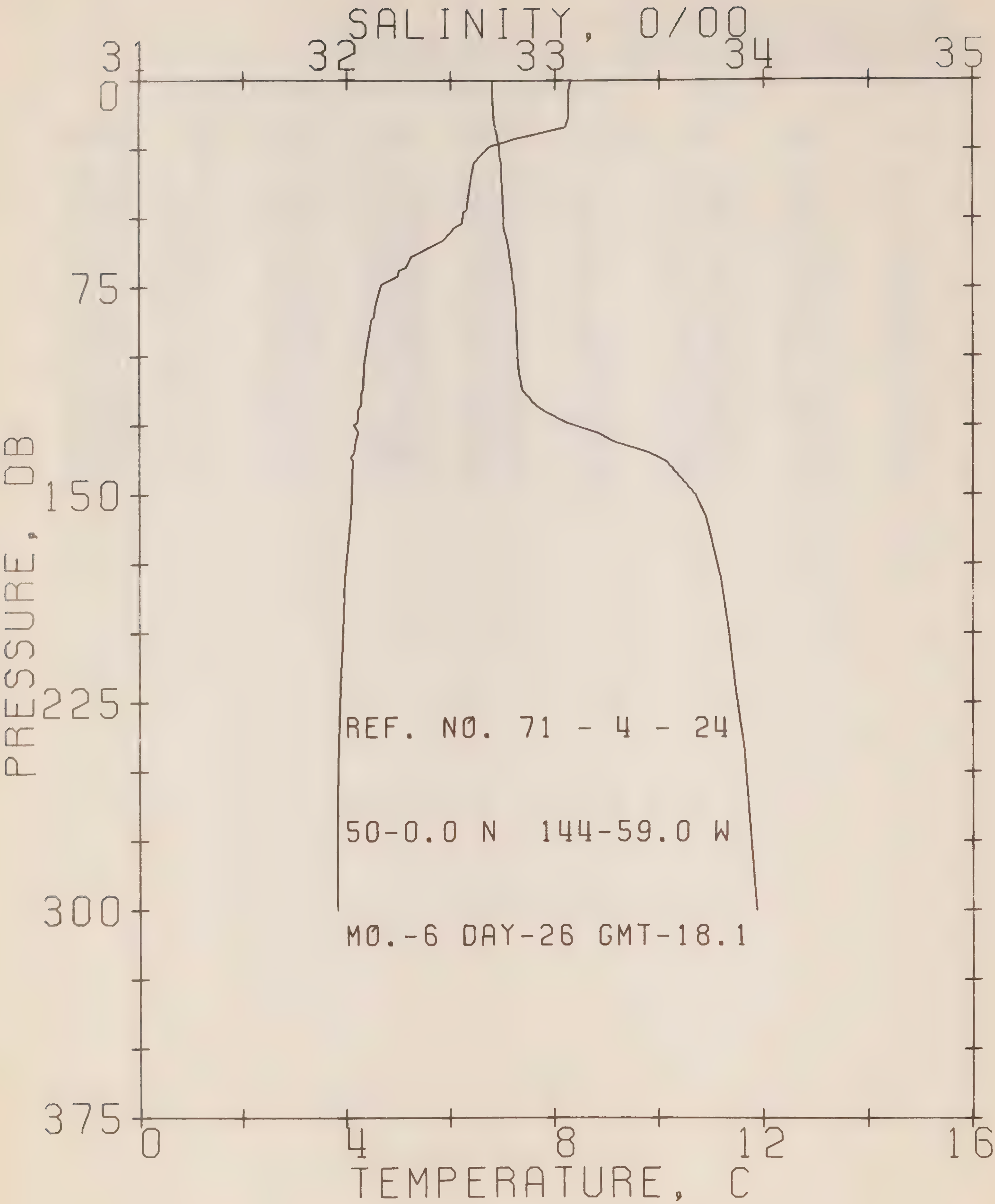
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 22 DATE 21/ 6/71
POSITION 50- 3.0N, 144-59.0W GMT 21.5
RESULTS OF STP CAST 62 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.92	32.71	0	25.51	247.9	0.0	0.0	1480.
10	7.80	32.71	10	25.53	246.5	0.25	0.01	1479.
20	7.71	32.72	20	25.55	244.8	0.49	0.05	1479.
30	6.78	32.73	30	25.69	232.0	0.73	0.11	1476.
50	6.21	32.76	50	25.78	223.0	1.19	0.30	1474.
75	4.55	32.83	75	26.03	199.7	1.71	0.63	1467.
100	4.43	32.84	99	26.05	197.8	2.20	1.07	1467.
125	4.32	33.01	124	26.19	184.4	2.69	1.62	1468.
150	4.12	33.66	149	26.73	133.4	3.08	2.17	1468.
175	4.02	33.74	174	26.81	126.7	3.40	2.71	1468.
200	3.91	33.81	199	26.87	120.5	3.71	3.30	1468.
225	3.87	33.85	223	26.91	117.5	4.01	3.94	1468.
250	3.84	33.88	248	26.94	114.5	4.30	4.64	1469.
300	3.78	33.97	298	27.01	108.0	4.86	6.20	1469.
400	3.68	34.08	397	27.11	99.5	5.89	9.88	1471.
500	3.52	34.18	496	27.21	91.1	6.85	14.23	1472.
600	3.37	34.25	595	27.28	85.0	7.73	19.15	1473.
800	3.10	34.34	793	27.37	76.9	9.34	30.64	1475.
1000	2.81	34.43	990	27.47	68.4	10.79	43.88	1477.
1200	2.56	34.48	1188	27.53	63.1	12.10	58.55	1480.
1500	2.26	34.55	1483	27.61	56.1	13.90	83.17	1483.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 23
50-0.0 N 145-0.0 W
MO.-6 DAY-23 GMT-18.0
0
4
8
12
16
TEMPERATURE, C

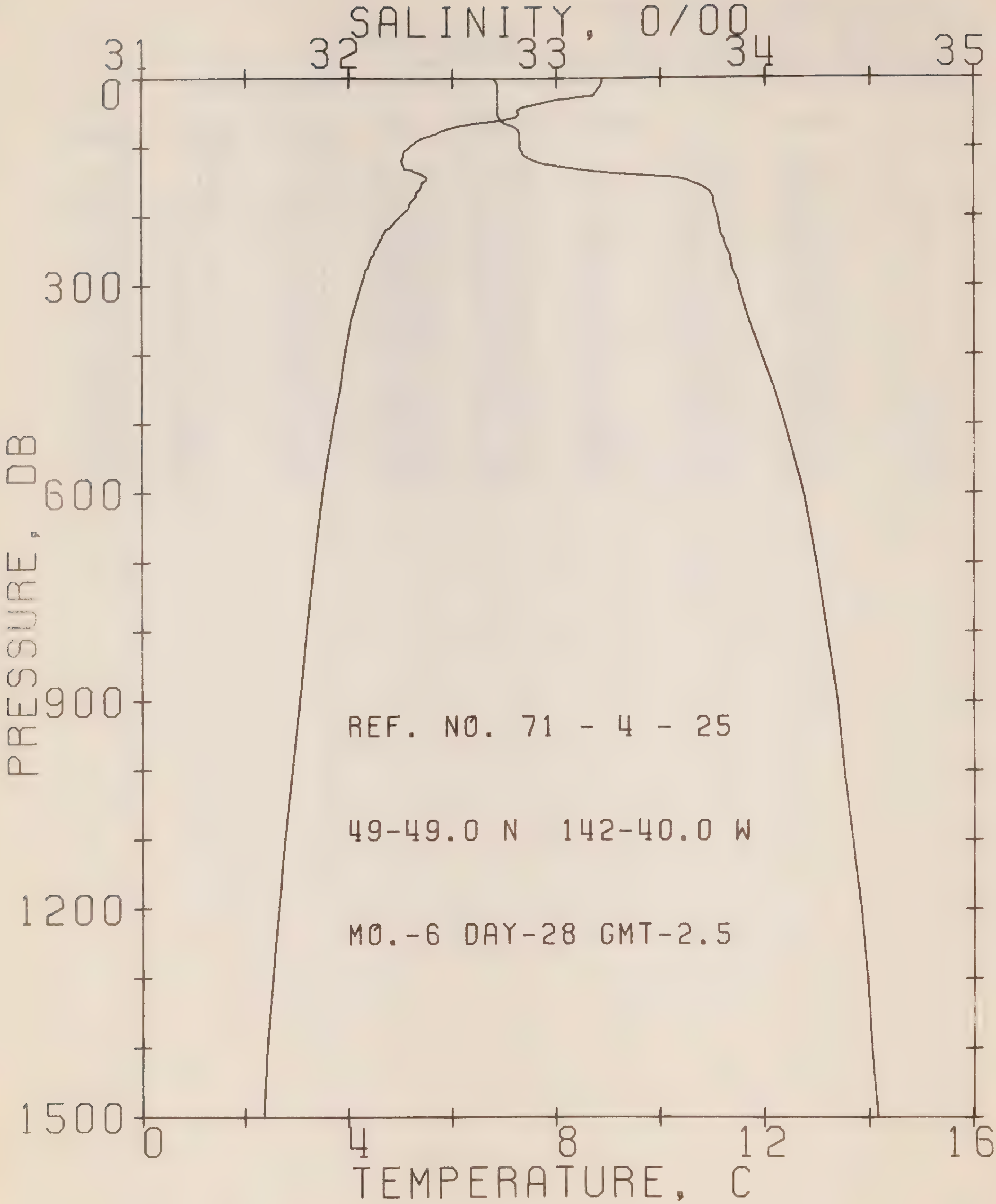
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 23 DATE 23/ 6/71
POSITION 50- 0.0N, 145- 0.0W GMT 18.0
RESULTS OF STP CAST 59 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.91	32.66	0	25.48	251.4	0.0	0.0	1480.
10	7.81	32.67	10	25.50	249.6	0.25	0.01	1479.
20	7.80	32.68	20	25.51	249.1	0.50	0.05	1479.
30	6.76	32.70	30	25.67	233.6	0.74	0.11	1476.
50	6.42	32.73	50	25.74	227.5	1.20	0.30	1475.
75	4.73	32.77	75	25.96	205.9	1.75	0.65	1468.
100	4.40	32.82	99	26.04	199.2	2.25	1.09	1467.
125	4.28	32.94	124	26.15	188.7	2.74	1.66	1467.
150	4.14	33.63	149	26.71	135.6	3.13	2.20	1468.
175	4.04	33.75	174	26.81	126.4	3.46	2.74	1468.
200	3.99	33.80	199	26.86	122.1	3.77	3.33	1468.
225	3.91	33.84	223	26.90	118.6	4.07	3.98	1469.
250	3.87	33.88	248	26.93	115.4	4.36	4.69	1469.
300	3.83	33.95	298	26.99	110.0	4.92	6.27	1470.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 24
50-0.0 N 144-59.0 W
MO.-6 DAY-26 GMT-18.1
0
4
8
12
16
TEMPERATURE, C

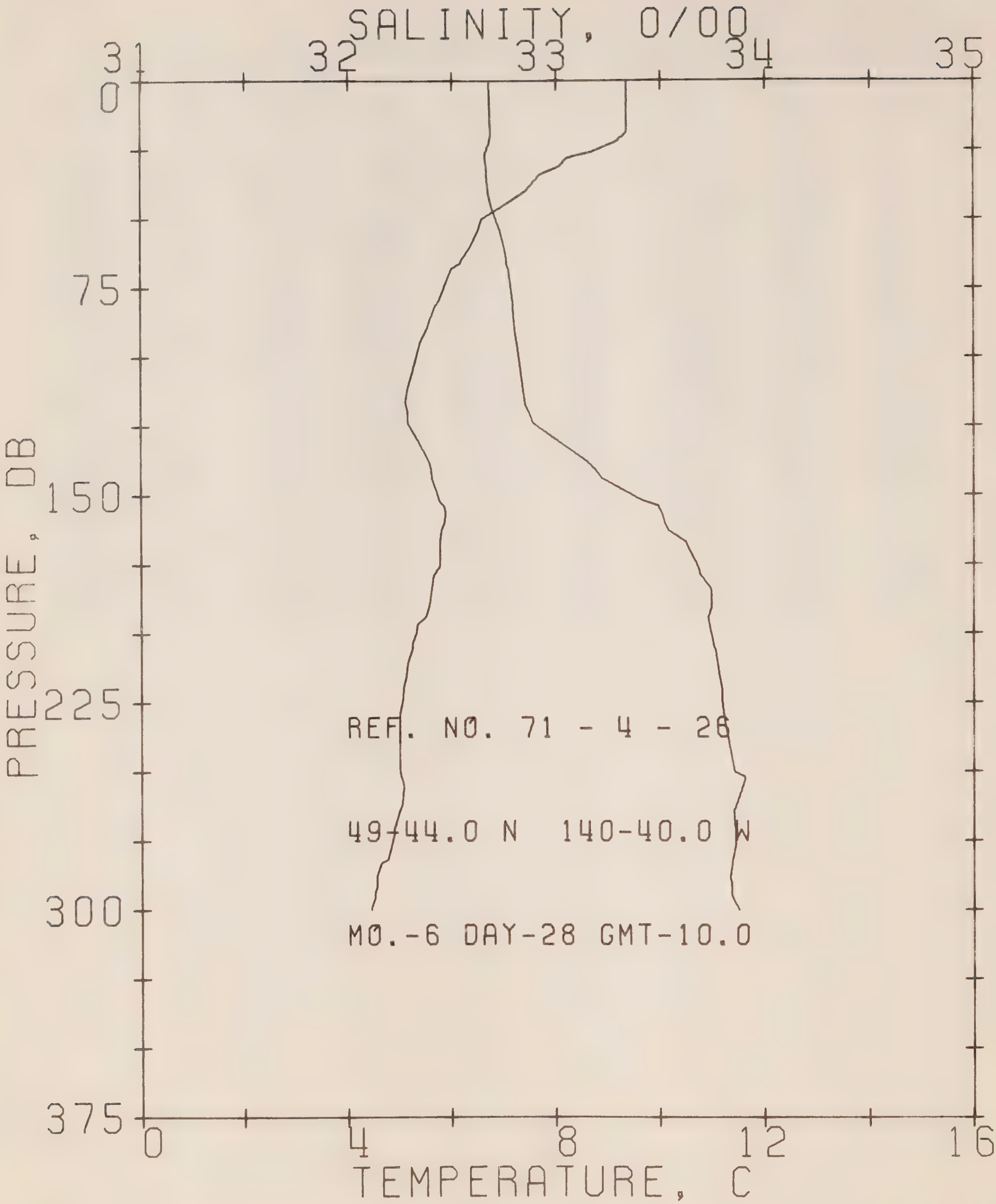
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 24   DATE 26/ 6/71
POSITION 50- 0.0N, 144-59.0W   GMT 18.1
RESULTS OF STP CAST   46 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.33	32.70	0	25.45	254.3	0.0	0.0	1481.
10	8.29	32.71	10	25.46	253.7	0.25	0.01	1481.
20	7.56	32.73	20	25.58	242.0	0.51	0.05	1479.
30	6.48	32.75	30	25.74	226.8	0.74	0.11	1475.
50	6.26	32.76	50	25.78	223.7	1.19	0.29	1474.
75	4.68	32.81	75	26.00	202.3	1.72	0.63	1468.
100	4.38	32.83	99	26.05	198.2	2.22	1.08	1467.
125	4.13	33.10	124	26.29	175.4	2.70	1.63	1467.
150	4.11	33.68	149	26.75	131.8	3.07	2.15	1468.
175	4.00	33.78	174	26.84	123.1	3.39	2.67	1468.
200	3.93	33.84	199	26.90	118.4	3.69	3.25	1468.
225	3.87	33.88	223	26.93	115.0	3.98	3.88	1468.
250	3.83	33.92	248	26.97	111.8	4.27	4.56	1469.
300	3.80	33.97	298	27.01	108.2	4.82	6.10	1470.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 25
49-49.0 N 142-40.0 W
MO.-6 DAY-28 GMT-2.5
0
4
8
12
16
TEMPERATURE, C

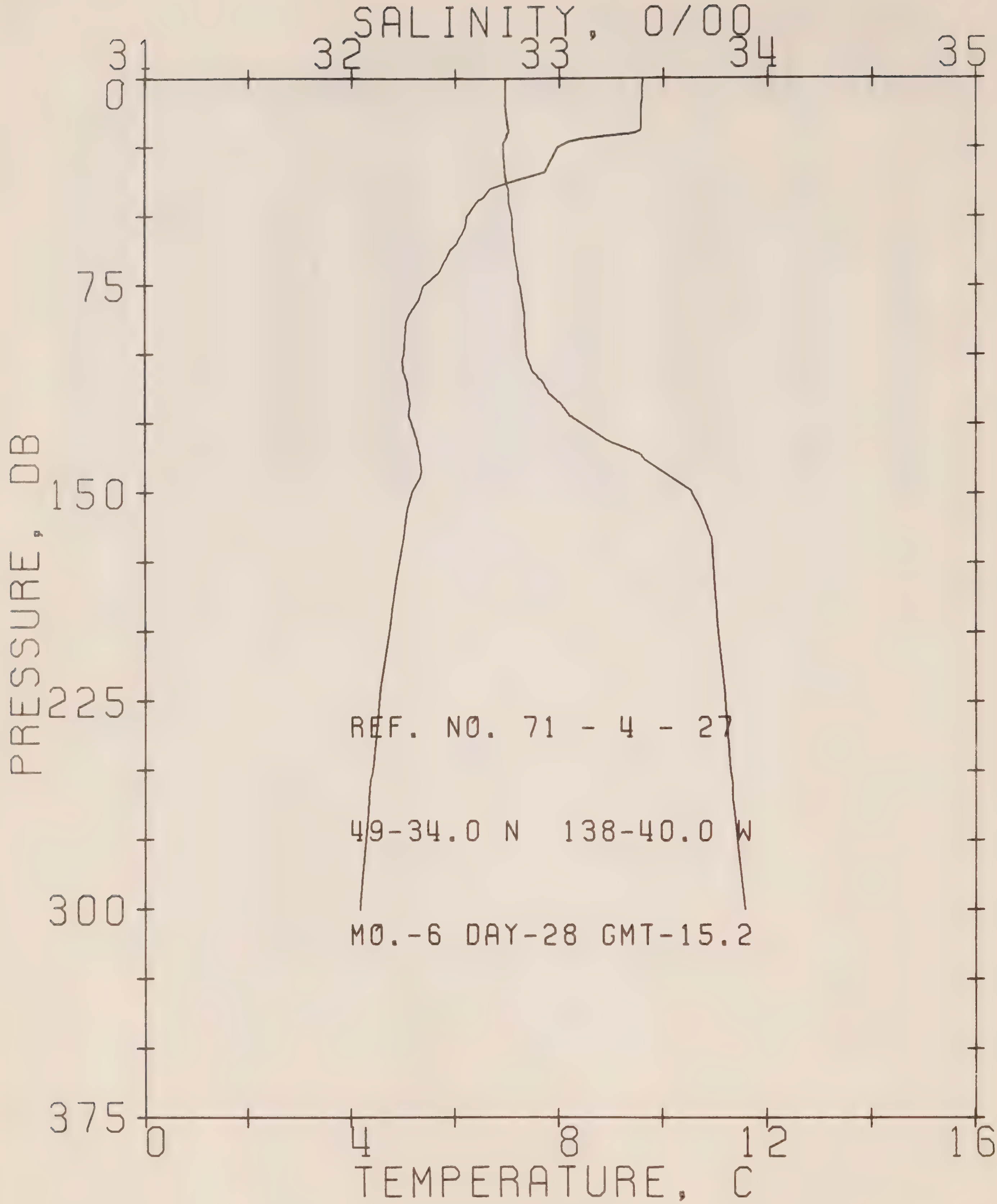
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 25 DATE 28/ 6/71
POSITION 49-49.0N, 142-40.0W GMT 2.5
RESULTS OF STP CAST 80 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.91	32.70	0	25.36	262.8	0.0	0.0	1483.
10	8.89	32.72	10	25.38	261.4	0.26	0.01	1484.
20	8.80	32.72	20	25.39	260.1	0.52	0.05	1483.
30	8.26	32.72	30	25.47	252.6	0.78	0.12	1481.
50	7.27	32.72	50	25.61	239.4	1.27	0.32	1478.
75	5.90	32.82	75	25.87	215.0	1.84	0.68	1473.
100	5.19	32.83	99	25.96	206.7	2.37	1.15	1471.
125	5.03	32.96	124	26.08	195.3	2.87	1.73	1470.
150	5.48	33.64	149	26.57	149.4	3.31	2.33	1474.
175	5.29	33.76	174	26.68	138.9	3.66	2.92	1473.
200	5.03	33.78	199	26.73	134.6	4.01	3.58	1473.
225	4.71	33.80	223	26.78	130.1	4.34	4.30	1472.
250	4.52	33.83	248	26.83	125.9	4.66	5.07	1472.
300	4.27	33.88	298	26.89	119.8	5.27	6.79	1471.
400	3.95	33.99	397	27.01	109.0	6.42	10.86	1472.
500	3.72	34.10	496	27.12	99.2	7.46	15.62	1473.
600	3.50	34.19	595	27.22	91.0	8.41	20.93	1473.
800	3.20	34.30	793	27.33	81.0	10.12	33.11	1476.
1000	2.92	34.38	990	27.42	73.3	11.66	47.15	1478.
1200	2.65	34.46	1188	27.51	65.6	13.04	62.67	1480.
1500	2.34	34.54	1484	27.60	57.7	14.89	88.00	1484.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 26
49-44.0 N 140-40.0 W
MO.-6 DAY-28 GMT-10.0
0
4
8
12
16
TEMPERATURE, C

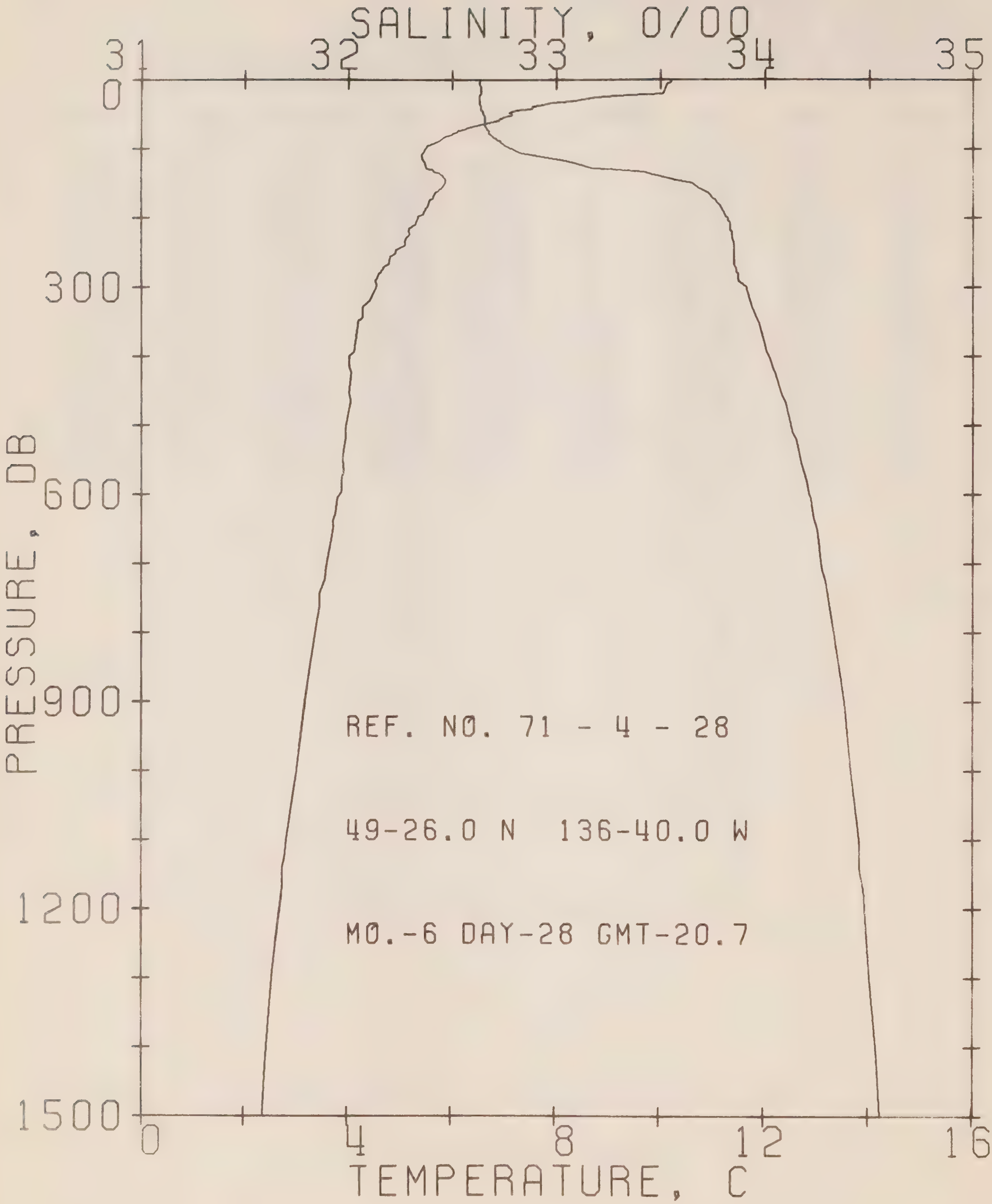
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 26 DATE 28/ 6/71
POSITION 49-44.0N, 140-40.0W GMT 10.0
RESULTS OF STP CAST 66 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.39	32.68	0	25.27	271.4	0.0	0.0	1485.
10	9.39	32.69	10	25.27	271.4	0.27	0.01	1485.
20	9.33	32.69	20	25.28	270.6	0.54	0.06	1485.
30	8.16	32.67	30	25.44	255.1	0.81	0.12	1481.
50	6.61	32.72	50	25.70	230.9	1.29	0.32	1475.
75	5.88	32.79	75	25.85	217.0	1.85	0.68	1473.
100	5.35	32.83	99	25.94	208.4	2.38	1.15	1471.
125	5.17	32.92	124	26.03	199.9	2.90	1.74	1471.
150	5.71	33.37	149	26.33	172.5	3.36	2.39	1474.
175	5.79	33.68	174	26.56	150.5	3.76	3.05	1475.
200	5.33	33.75	199	26.67	140.3	4.12	3.74	1474.
225	5.05	33.80	223	26.75	133.5	4.46	4.48	1473.
250	4.99	33.86	248	26.80	128.8	4.79	5.27	1474.
300	4.42	33.88	298	26.88	121.4	5.43	7.05	1472.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 27
49-34.0 N 138-40.0 W
MO.-6 DAY-28 GMT-15.2
0
4
8
12
16
TEMPERATURE, C

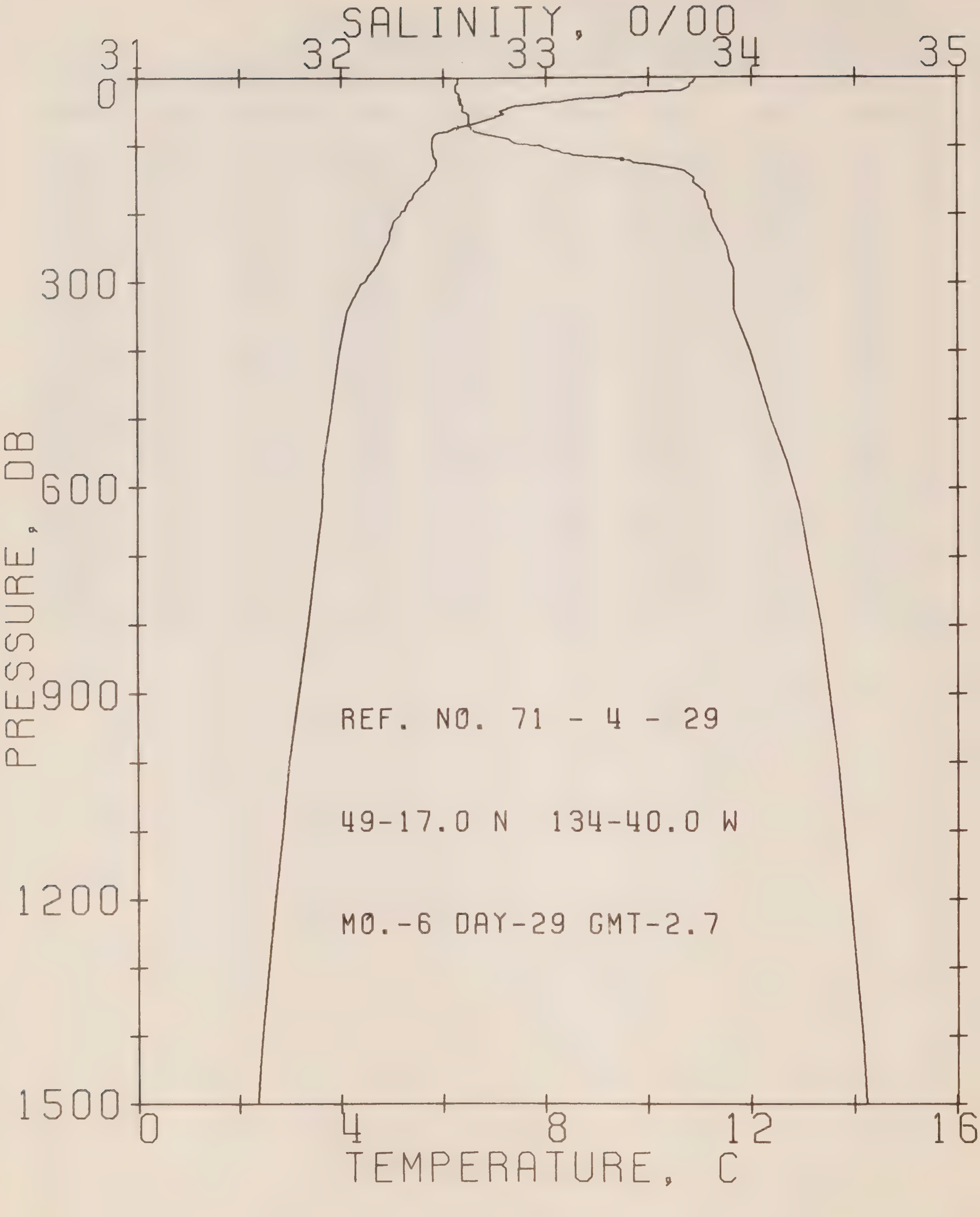
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 27 DATE 28/ 6/71
POSITION 49-34.0N, 138-40.0W GMT 15.2
RESULTS OF STP CAST 52 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.61	32.74	0	25.28	270.3	0.0	0.0	1486.
10	9.60	32.74	10	25.28	270.6	0.27	0.01	1486.
20	9.46	32.75	20	25.31	267.9	0.54	0.06	1486.
30	7.88	32.74	30	25.54	246.0	0.79	0.12	1480.
50	6.26	32.78	50	25.79	222.1	1.26	0.31	1474.
75	5.42	32.82	75	25.93	209.6	1.80	0.65	1471.
100	5.01	32.85	99	26.00	203.1	2.31	1.11	1470.
125	5.15	33.12	124	26.19	184.6	2.80	1.67	1471.
150	5.19	33.65	149	26.61	145.8	3.22	2.25	1472.
175	4.95	33.75	174	26.71	136.0	3.57	2.82	1472.
200	4.75	33.77	199	26.75	132.3	3.90	3.46	1472.
225	4.55	33.80	223	26.80	127.8	4.22	4.17	1471.
250	4.43	33.83	248	26.84	124.8	4.54	4.93	1471.
300	4.15	33.90	298	26.92	117.1	5.15	6.62	1471.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 28
49-26.0 N 136-40.0 W
MO.-6 DAY-28 GMT-20.7
0
4
8
12
16
TEMPERATURE, C

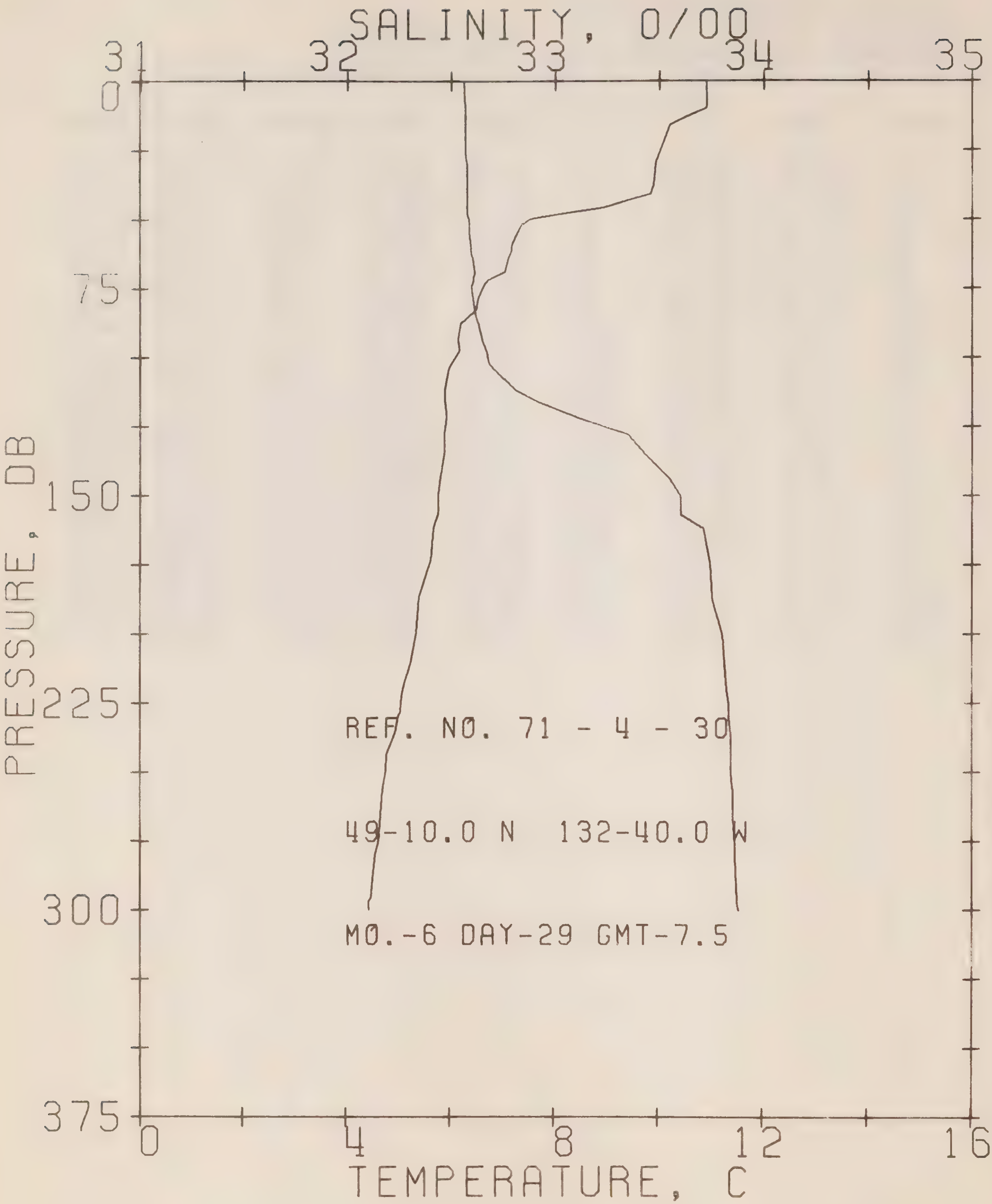
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 28 DATE 28/ 6/71
POSITION 49-26.0N, 136-40.0W GMT 20.7
RESULTS OF STP CAST 114 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.24	32.63	0	25.09	288.4	0.0	0.0	1488.
10	10.15	32.64	10	25.11	286.7	0.29	0.01	1488.
20	10.09	32.64	20	25.12	285.9	0.57	0.06	1488.
30	8.48	32.63	30	25.37	262.4	0.85	0.13	1482.
50	7.14	32.65	50	25.58	242.5	1.35	0.33	1477.
75	6.14	32.68	75	25.73	228.5	1.94	0.71	1474.
100	5.50	32.79	99	25.89	213.1	2.49	1.20	1472.
125	5.48	33.14	124	26.17	187.2	2.99	1.77	1473.
150	5.89	33.66	149	26.53	153.1	3.41	2.36	1475.
175	5.60	33.77	174	26.66	141.5	3.78	2.97	1475.
200	5.38	33.83	199	26.73	134.9	4.13	3.63	1474.
225	5.20	33.85	223	26.77	131.7	4.46	4.35	1474.
250	4.93	33.86	248	26.80	128.1	4.78	5.13	1473.
300	4.58	33.92	298	26.89	120.2	5.41	6.88	1473.
400	4.03	34.03	397	27.04	106.9	6.54	10.91	1472.
500	3.98	34.13	496	27.12	99.4	7.57	15.64	1474.
600	3.87	34.22	595	27.21	92.4	8.53	21.00	1475.
800	3.39	34.34	793	27.35	80.0	10.25	33.22	1476.
1000	3.03	34.42	990	27.44	71.5	11.75	47.00	1478.
1200	2.70	34.49	1188	27.53	64.1	13.10	62.11	1480.
1500	2.33	34.56	1484	27.62	56.2	14.90	86.72	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 29
49-17.0 N 134-40.0 W
MO.-6 DAY-29 GMT-2.7
0
4
8
12
16
TEMPERATURE, C

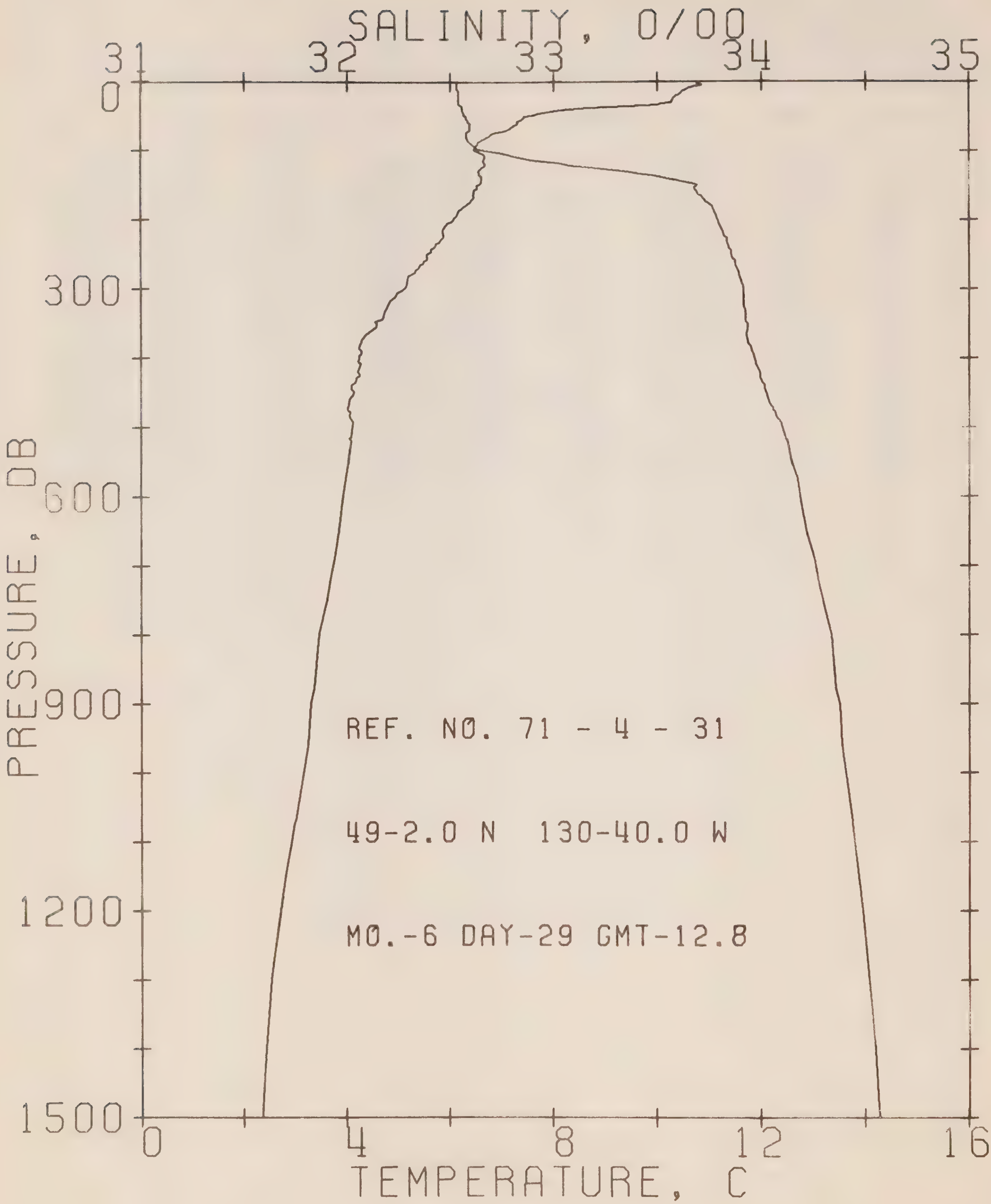
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 29 DATE 29/ 6/71
POSITION 49-17.0N, 134-40.0W GMT 2.7
RESULTS OF STP CAST 83 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.94	32.57	0	24.92	304.3	0.0	0.0	1491.
10	10.83	32.56	10	24.93	303.7	0.30	0.02	1490.
20	10.66	32.56	20	24.96	301.0	0.61	0.06	1490.
30	9.16	32.59	30	25.23	275.4	0.89	0.13	1485.
50	7.12	32.61	50	25.54	245.8	1.40	0.34	1477.
75	6.21	32.65	75	25.69	231.8	2.00	0.72	1474.
100	5.79	32.98	99	26.01	202.2	2.55	1.21	1473.
125	5.88	33.43	124	26.35	169.7	3.02	1.75	1475.
150	5.71	33.72	149	26.61	146.1	3.40	2.28	1475.
175	5.43	33.78	174	26.68	139.1	3.76	2.87	1474.
200	5.19	33.81	199	26.74	134.2	4.10	3.52	1473.
225	4.99	33.85	223	26.79	129.3	4.43	4.23	1473.
250	4.86	33.89	248	26.84	125.1	4.75	5.00	1473.
300	4.42	33.92	298	26.91	118.4	5.36	6.71	1472.
400	3.98	34.00	397	27.02	108.6	6.50	10.77	1472.
500	3.79	34.10	496	27.12	100.0	7.54	15.53	1473.
600	3.64	34.21	595	27.22	90.7	8.49	20.84	1474.
800	3.35	34.34	793	27.35	79.6	10.19	32.92	1476.
1000	2.98	34.42	990	27.45	70.9	11.69	46.68	1478.
1200	2.71	34.48	1188	27.52	64.8	13.05	61.88	1480.
1500	2.34	34.56	1484	27.62	56.3	14.85	86.62	1484.


SALINITY, O/OO
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 4 - 30
49-10.0 N 132-40.0 W
MO.-6 DAY-29 GMT-7.5
0
4
8
12
16
TEMPERATURE, C

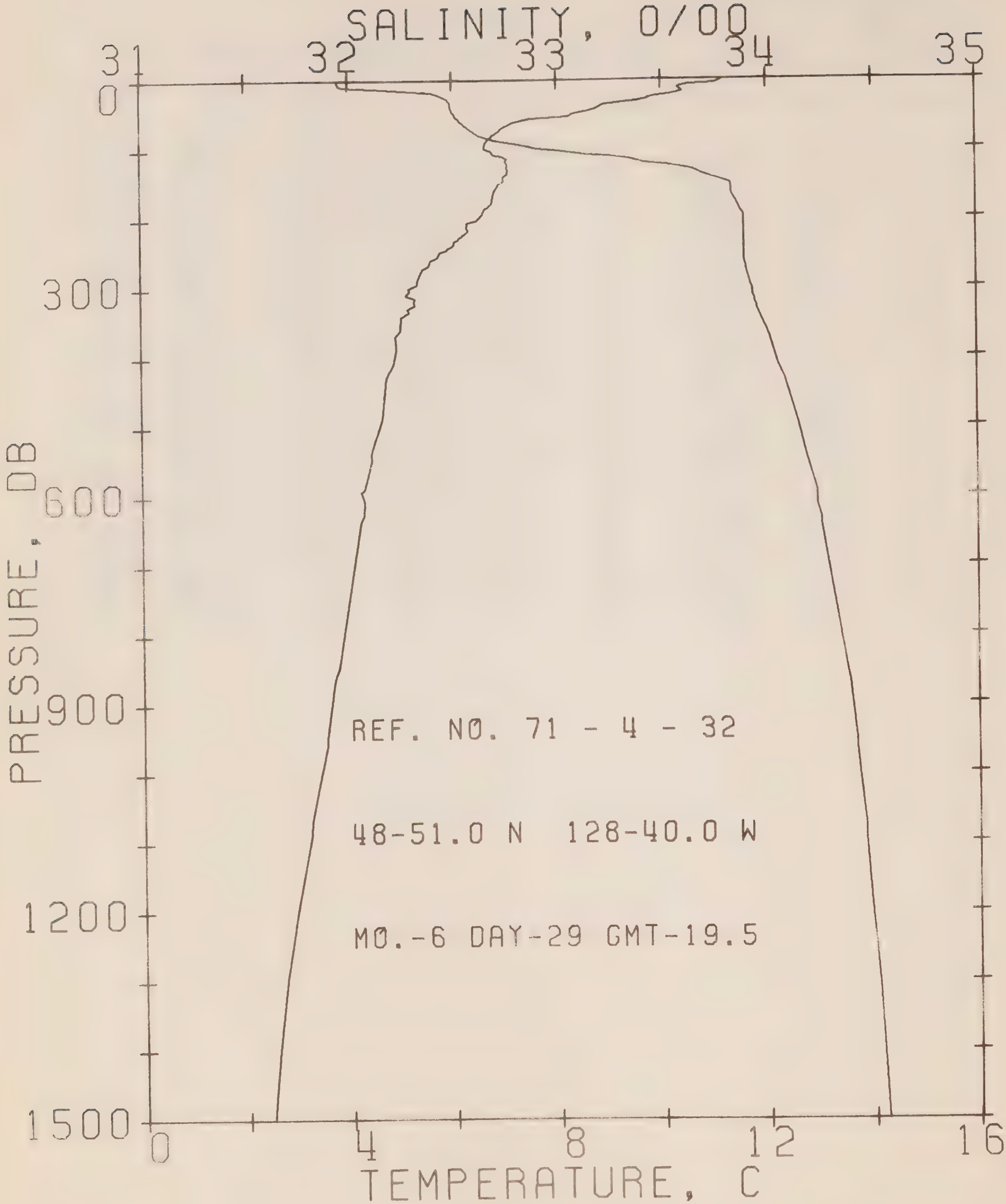
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 30 DATE 29/ 6/71
POSITION 49-10.0N, 132-40.0W GMT 7.5
RESULTS OF STP CAST 56 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.92	32.56	0	24.92	304.8	0.0	0.0	1491.
10	10.93	32.57	10	24.92	304.6	0.30	0.02	1491.
20	10.16	32.57	20	25.05	292.2	0.60	0.06	1488.
30	9.96	32.58	30	25.10	288.4	0.89	0.13	1488.
50	7.56	32.59	50	25.47	252.9	1.45	0.36	1479.
75	6.65	32.60	75	25.60	240.4	2.07	0.75	1476.
100	6.11	32.68	99	25.74	228.0	2.65	1.28	1474.
125	5.91	33.24	124	26.20	184.4	3.18	1.88	1474.
150	5.78	33.61	149	26.51	155.5	3.60	2.46	1475.
175	5.60	33.75	174	26.64	143.2	3.97	3.08	1475.
200	5.35	33.81	199	26.72	136.1	4.32	3.75	1474.
225	5.05	33.84	223	26.78	130.7	4.66	4.47	1473.
250	4.76	33.85	248	26.82	126.9	4.98	5.25	1473.
300	4.40	33.89	298	26.89	120.5	5.60	6.98	1472.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 31
49-2.0 N 130-40.0 W
MO.-6 DAY-29 GMT-12.8
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 31 DATE 29/ 6/71
POSITION 49- 2.0N, 130-40.0W GMT 12.8
RESULTS OF STP CAST 139 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.76	32.53	0	24.92	304.3	0.0	0.0	1490.
10	10.61	32.53	10	24.95	302.3	0.31	0.02	1490.
20	10.44	32.54	20	24.98	298.9	0.61	0.06	1489.
30	10.30	32.54	30	25.01	296.8	0.90	0.14	1489.
50	7.46	32.58	50	25.48	252.3	1.45	0.36	1478.
75	6.83	32.58	75	25.56	244.4	2.07	0.75	1476.
100	6.52	32.68	99	25.68	233.4	2.67	1.29	1476.
125	6.61	33.19	124	26.07	196.7	3.21	1.91	1477.
150	6.53	33.70	149	26.48	158.0	3.65	2.52	1478.
175	6.39	33.74	174	26.54	153.2	4.04	3.17	1478.
200	6.07	33.80	199	26.62	145.7	4.41	3.88	1477.
225	5.89	33.83	223	26.67	141.3	4.77	4.65	1477.
250	5.56	33.86	248	26.73	135.3	5.12	5.49	1476.
300	5.12	33.92	298	26.83	126.3	5.77	7.32	1475.
400	4.24	33.97	397	26.97	113.3	6.97	11.57	1473.
500	4.12	34.11	496	27.09	103.0	8.05	16.53	1474.
600	3.93	34.19	595	27.17	95.5	9.04	22.07	1475.
800	3.47	34.34	793	27.34	80.9	10.81	34.69	1477.
1000	3.17	34.41	990	27.42	74.0	12.37	48.92	1479.
1200	2.72	34.49	1188	27.53	64.1	13.74	64.32	1480.
1500	2.34	34.57	1484	27.62	55.5	15.52	88.70	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 4 - 32
48-51.0 N 128-40.0 W
MO.-6 DAY-29 GMT-19.5
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 4- 32 DATE 29/ 6/71
POSITION 48-51.0N, 128-40.0W GMT 19.5
RESULTS OF STP CAST 108 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	11.19	31.95	0	24.39	354.4	0.0	0.0	1491.
10	10.41	31.98	10	24.55	339.7	0.35	0.02	1488.
20	10.33	32.43	20	24.92	305.4	0.67	0.07	1489.
30	9.63	32.49	30	25.08	289.9	0.97	0.14	1486.
50	8.34	32.52	50	25.30	268.7	1.52	0.37	1482.
75	6.91	32.61	75	25.58	242.8	2.15	0.77	1477.
100	6.66	32.95	99	25.88	214.8	2.73	1.28	1477.
125	7.08	33.58	124	26.31	174.0	3.21	1.83	1480.
150	6.93	33.84	149	26.54	152.8	3.62	2.41	1480.
175	6.79	33.86	174	26.58	149.5	4.00	3.03	1480.
200	6.53	33.90	199	26.64	143.3	4.37	3.73	1479.
225	6.21	33.90	223	26.68	140.0	4.72	4.50	1478.
250	5.78	33.90	248	26.74	135.0	5.07	5.33	1477.
300	5.16	33.94	298	26.84	125.3	5.72	7.16	1475.
400	4.91	34.05	397	26.96	115.2	6.93	11.46	1476.
500	4.61	34.16	496	27.08	104.7	8.02	16.46	1476.
600	4.24	34.24	595	27.18	95.3	9.02	22.05	1477.
800	3.88	34.35	793	27.31	84.7	10.83	34.88	1479.
1000	3.43	34.43	991	27.42	74.9	12.41	49.40	1480.
1200	2.94	34.49	1188	27.51	66.6	13.83	65.20	1481.
1500	2.43	34.56	1484	27.61	57.3	15.67	90.46	1484.

SURFACE TEMPERATURE AND SALINITY OBSERVATIONS

(P-71-4)

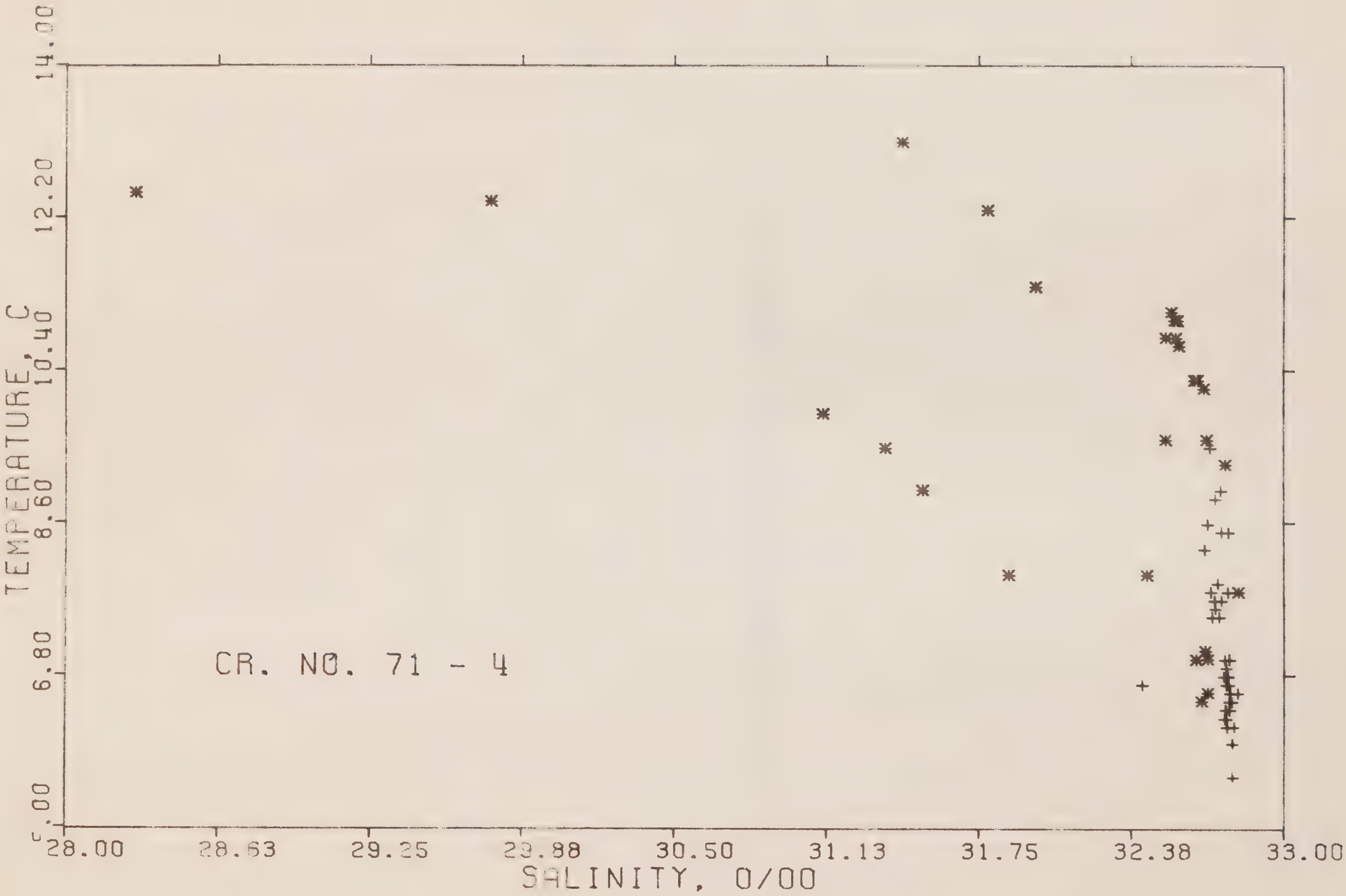


Fig. 7 T-S plot of surface temperature and salinity observations on Line P (asterisks) and at Station P (pluses) during P-71-4.

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 4

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	5	15	40	31.108	9.9	125-33
71	5	15	240	31.518	9.0	126- 0
71	5	15	440	31.367	9.5	126-40
71	5	15	810	31.871	8.0	127-40
71	5	15	1210	32.438	8.0	128-40
71	5	15	0	32.244	0.0	130-40
71	5	15	2055	32.811	7.8	131-40
71	5	16	1200	32.661	6.5	135-40
71	5	16	1445	32.642	7.0	136-40
71	5	16	1745	32.687	6.6	137-40
71	5	16	2100	0.0	6.7	138-40
71	5	17	20	32.688	7.0	139-40
71	5	17	430	32.677	7.1	140-40
71	5	17	1040	32.418	6.7	141-40
71	5	18	0	0.0	6.0	145- 0
71	5	19	0	32.786	5.6	ON STATION
71	5	20	0	32.787	6.0	ON STATION
71	5	21	0	32.795	6.2	ON STATION
71	5	22	0	32.778	6.5	ON STATION
71	5	23	0	32.763	6.3	ON STATION
71	5	24	0	32.784	6.5	ON STATION
71	5	25	0	32.775	6.5	ON STATION
71	5	26	0	0.0	6.3	ON STATION
71	5	27	0	0.0	6.6	ON STATION
71	5	28	0	0.0	6.3	ON STATION
71	5	29	0	32.765	6.2	ON STATION
71	5	30	0	32.775	6.4	ON STATION
71	5	31	0	32.763	6.4	ON STATION
71	6	1	0	32.755	6.3	ON STATION
71	6	2	0	32.760	6.4	ON STATION
71	6	3	0	32.809	6.6	ON STATION
71	6	4	0	32.764	6.7	ON STATION
71	6	5	0	32.779	6.6	ON STATION
71	6	6	0	32.774	7.0	ON STATION
71	6	7	0	32.762	6.9	ON STATION
71	6	8	0	32.757	7.0	ON STATION
71	6	9	0	32.752	6.8	ON STATION
71	6	10	0	32.761	6.8	ON STATION
71	6	11	0	32.761	6.8	ON STATION
71	6	12	0	32.771	6.7	ON STATION
71	6	13	0	32.769	6.8	ON STATION
71	6	14	0	32.774	7.0	ON STATION
71	6	15	0	32.735	7.5	ON STATION
71	6	16	0	32.743	7.7	ON STATION
71	6	17	0	32.705	7.5	ON STATION
71	6	18	0	32.718	7.6	ON STATION
71	6	19	0	32.716	7.7	ON STATION
71	6	20	0	32.715	7.7	ON STATION
71	6	21	0	32.768	7.8	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 4

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	6	21	0	32.768	7.8	ON STATION
71	6	22	0	32.727	7.9	ON STATION
71	6	23	0	32.701	7.8	ON STATION
71	6	24	0	32.676	8.3	ON STATION
71	6	25	0	32.688	8.6	ON STATION
71	6	26	0	32.713	8.9	ON STATION
71	6	27	0	32.743	8.5	ON STATION
71	6	27	2240	32.771	8.5	143-40
71	6	28	230	32.742	9.0	142-40
71	6	28	715	32.696	9.5	141-40
71	6	28	1000	32.684	9.6	140-40
71	6	28	1345	32.760	9.3	139-40
71	6	28	1500	32.516	9.6	138-40
71	6	28	1755	32.672	10.2	137-40
71	6	28	2040	32.634	10.3	136-40
71	6	28	2330	32.648	10.3	135-40
71	6	29	245	32.539	11.1	134-40
71	6	29	515	32.569	10.7	133-40
71	6	29	730	32.555	10.8	132-40
71	6	29	1000	32.563	11.0	131-40
71	6	29	1250	32.551	11.0	130-40
71	6	29	1645	32.515	10.8	129-40
71	6	29	1930	31.980	11.4	128-40
71	6	29	2305	31.784	12.3	127-40
71	6	30	230	31.433	13.1	126-40
71	6	30	450	29.744	12.4	126- 0
71	6	30	645	28.285	12.5	125-33

OCEANOGRAPHIC DATA OBTAINED ON CRUISE P-71-5

(C.O.D.C. REFERENCE NO. 02-71-005)

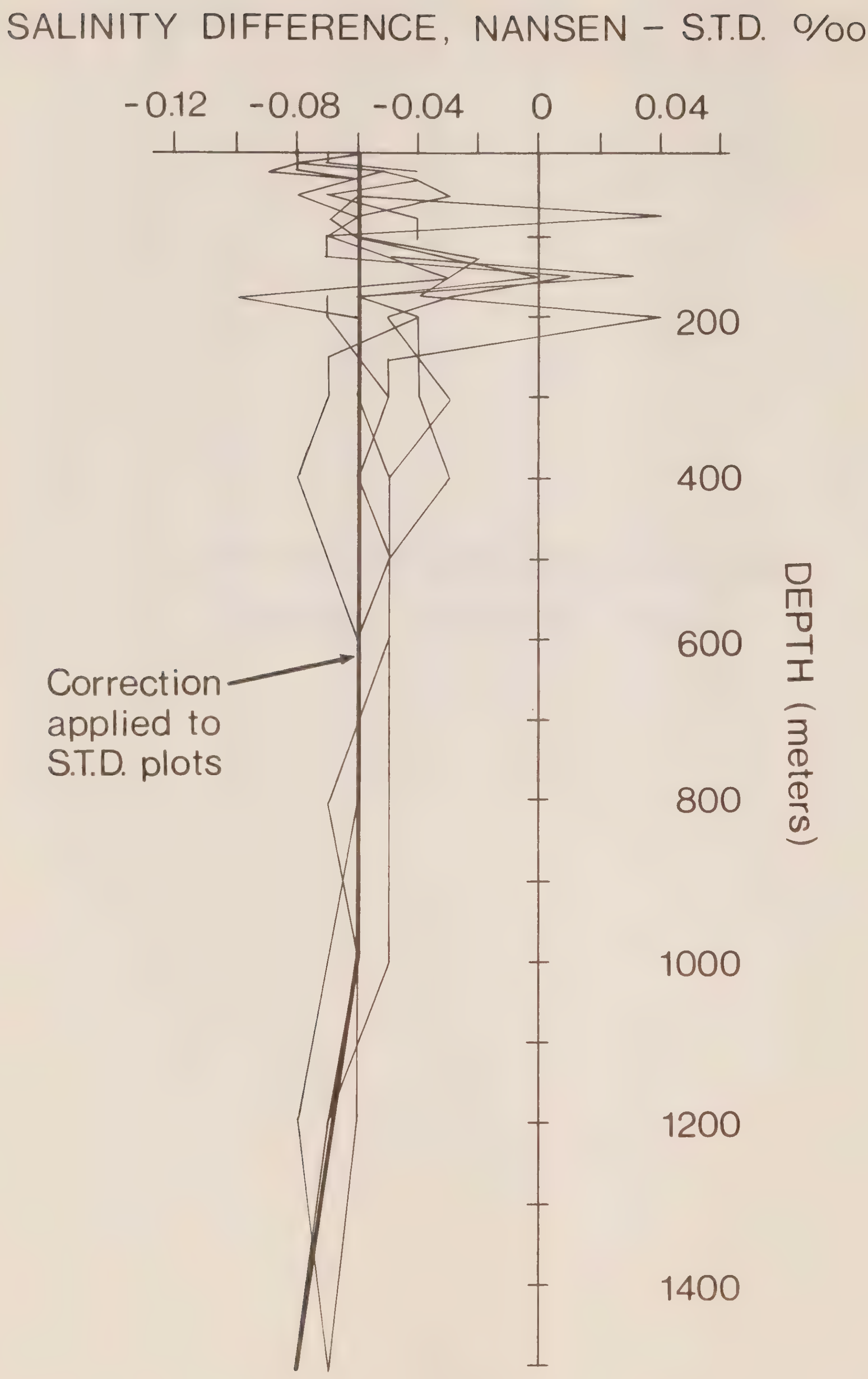


Fig. 8 Bottle - STD salinity value difference profiles P-71-5.

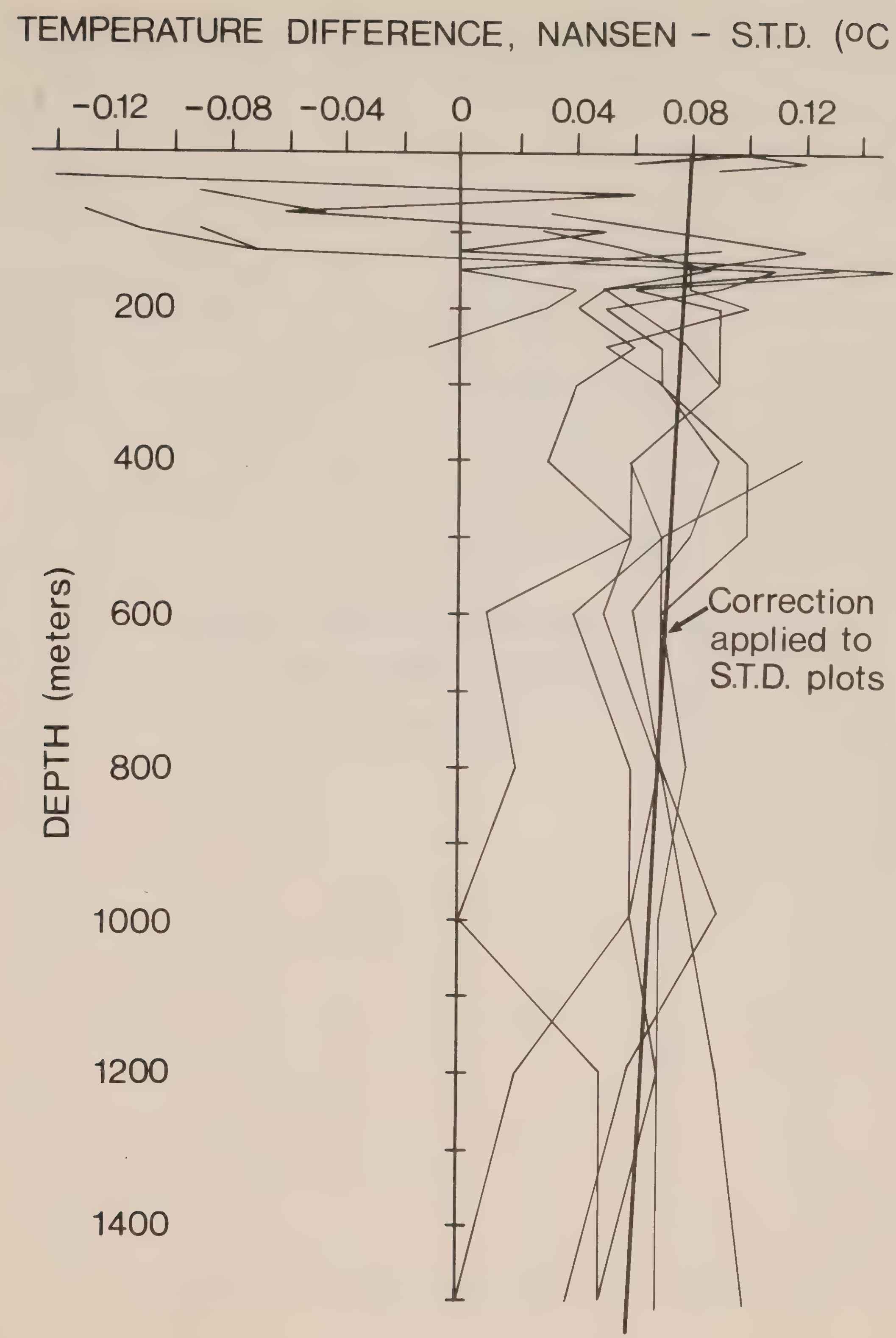


Fig. 9 Reversing thermometer - STD temperature difference profiles P-71-5.

COMPOSITE PLOTS OF TEMPERATURE, SALINITY

AND DISSOLVED OXYGEN vs DEPTH

(P-71-5)

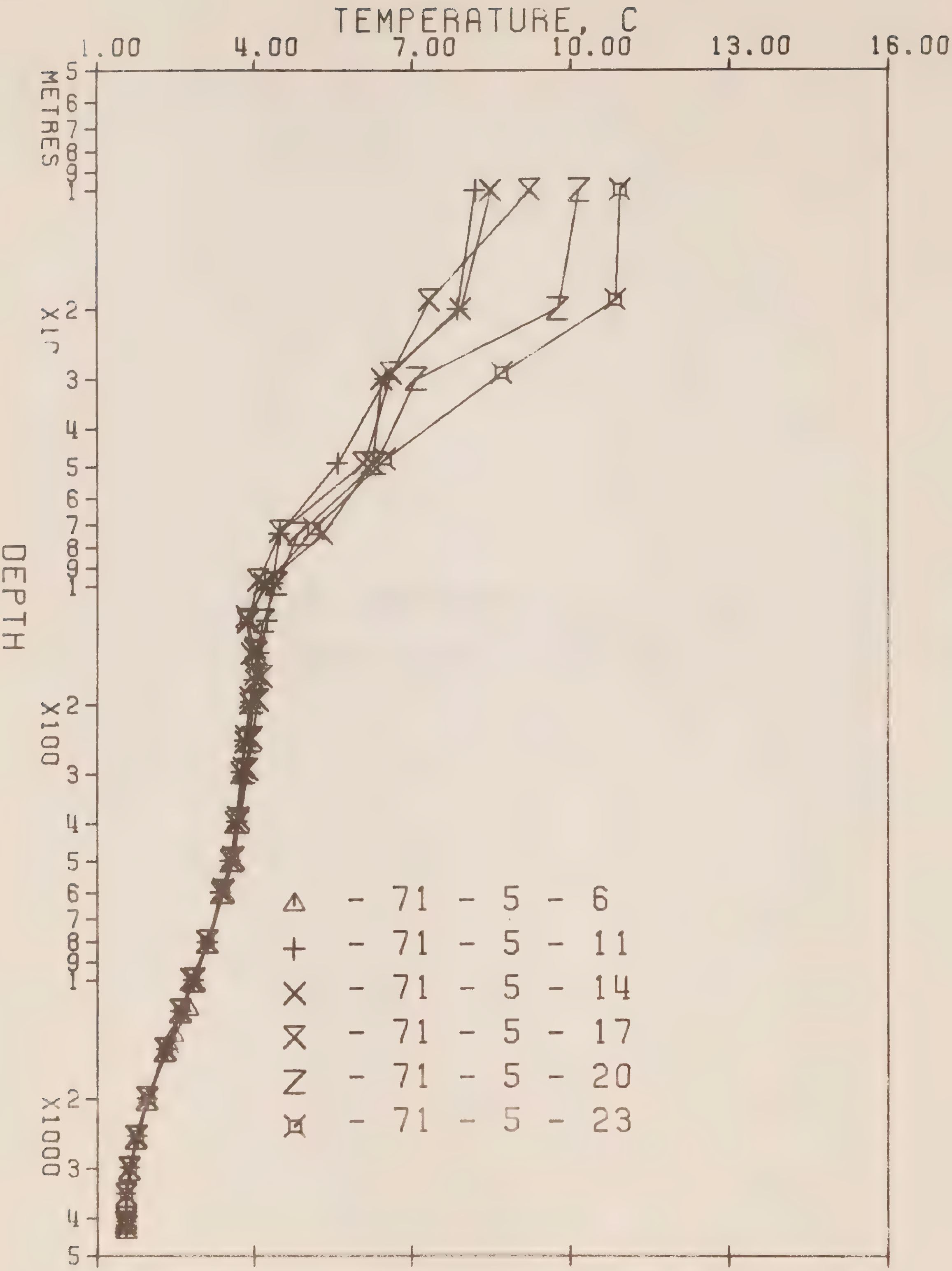


Fig. 10 Composite plot of temperature vs $\log_{10}$ depth P-71-5.

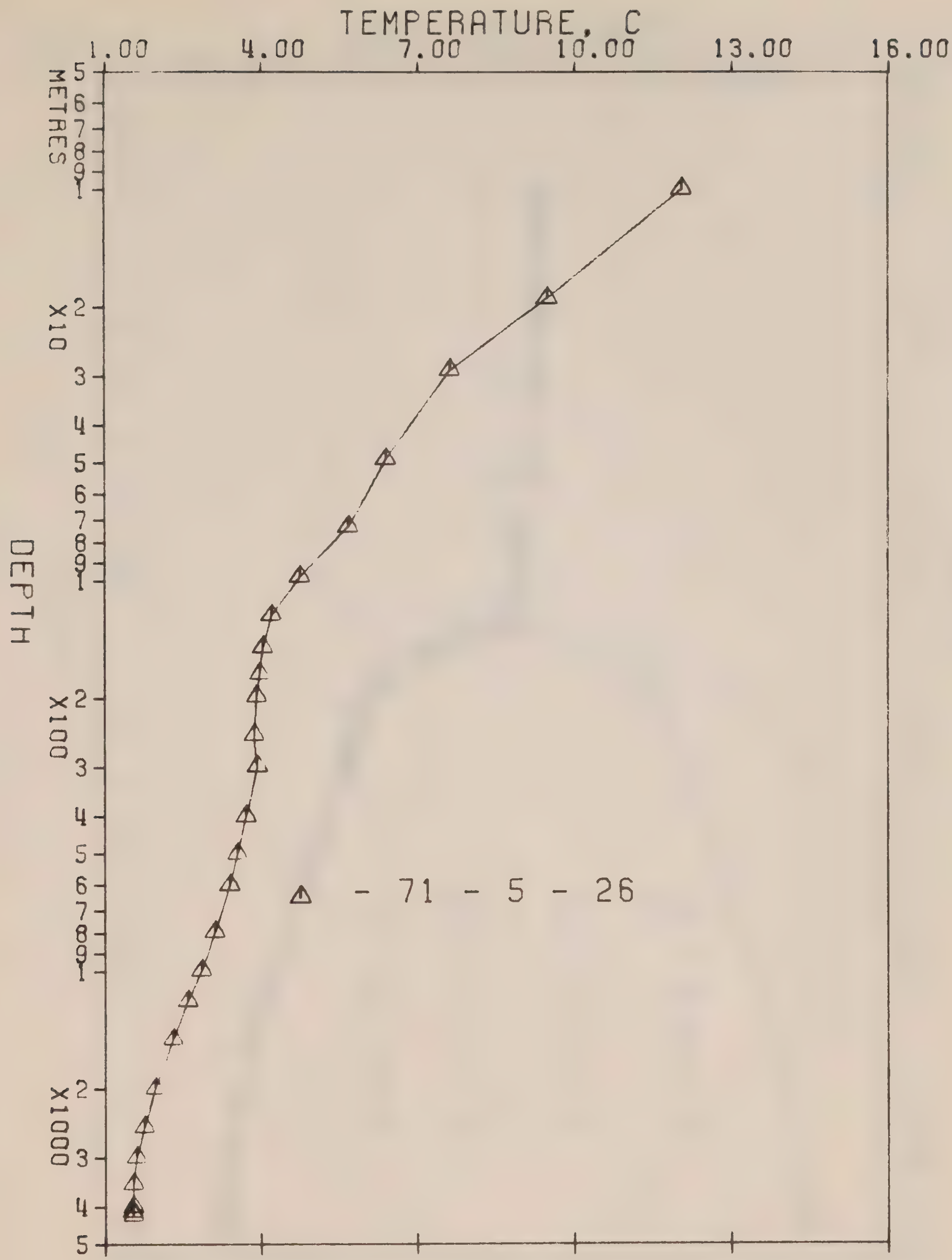


Fig. 11 Composite plot of temperature vs $\log_{10}$ depth P-71-5.

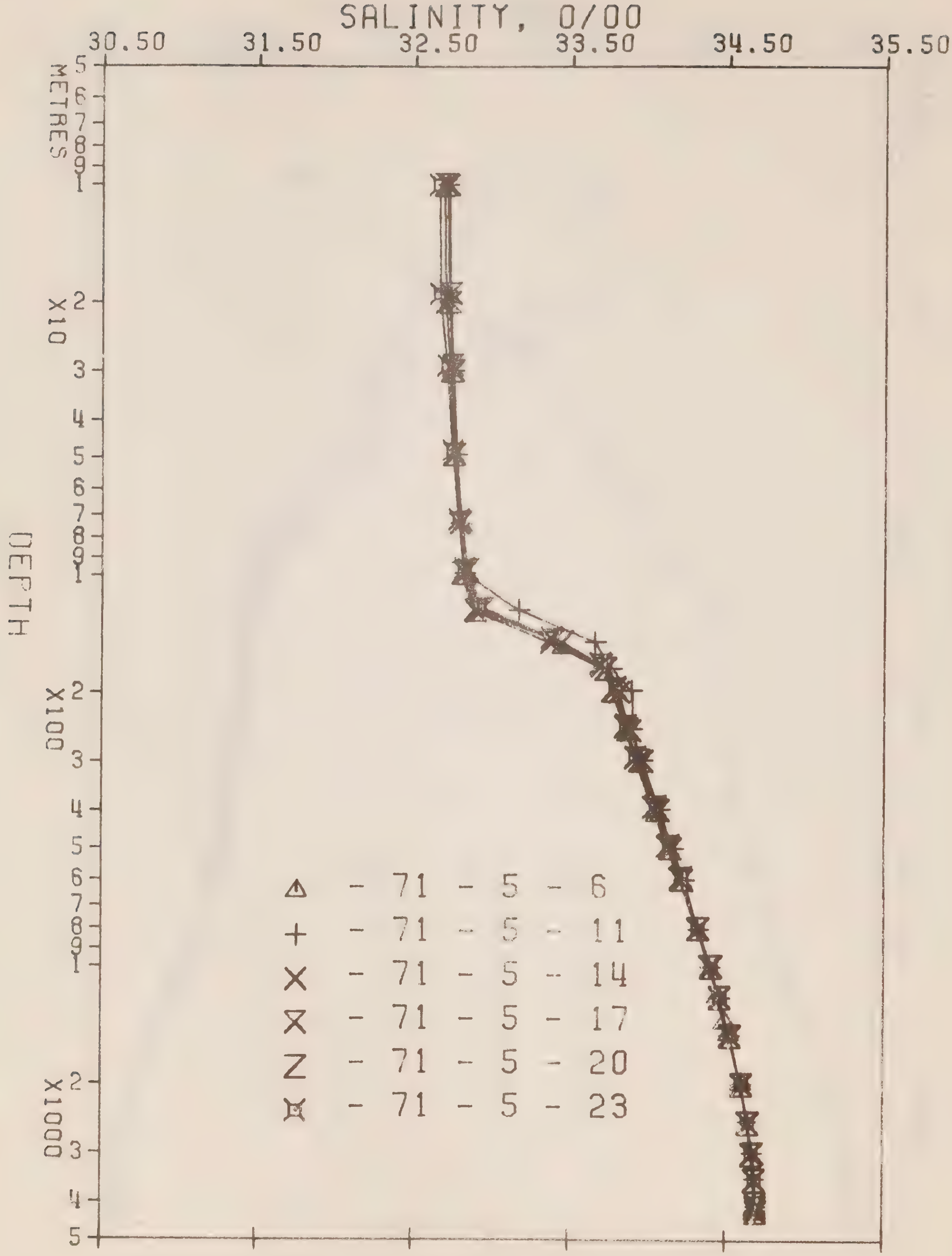


Fig. 12 Composite plot of salinity vs $\log_{10}$ depth P-71-5.

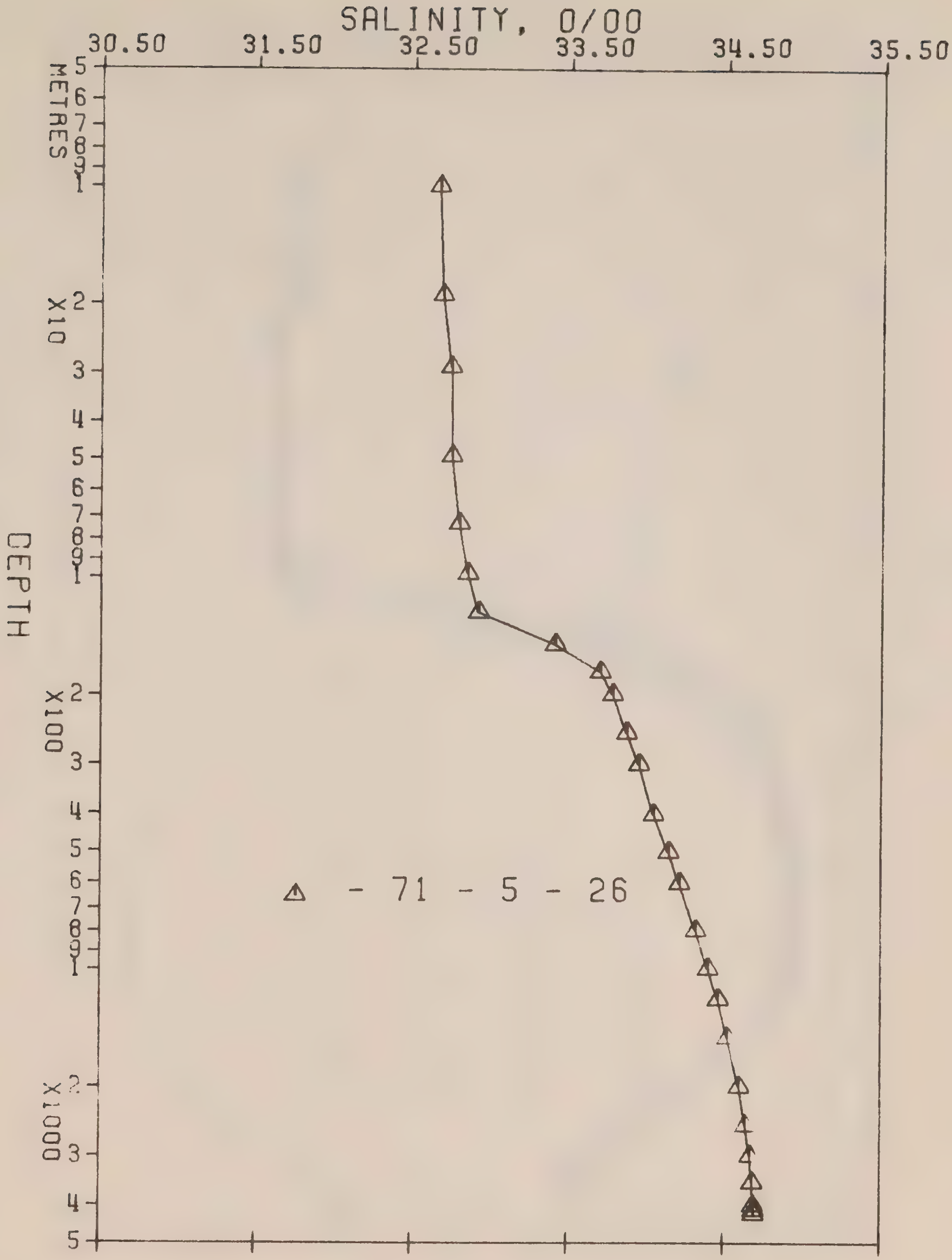


Fig. 13 Composite plot of salinity vs $\log_{10}$ depth P-71-5.

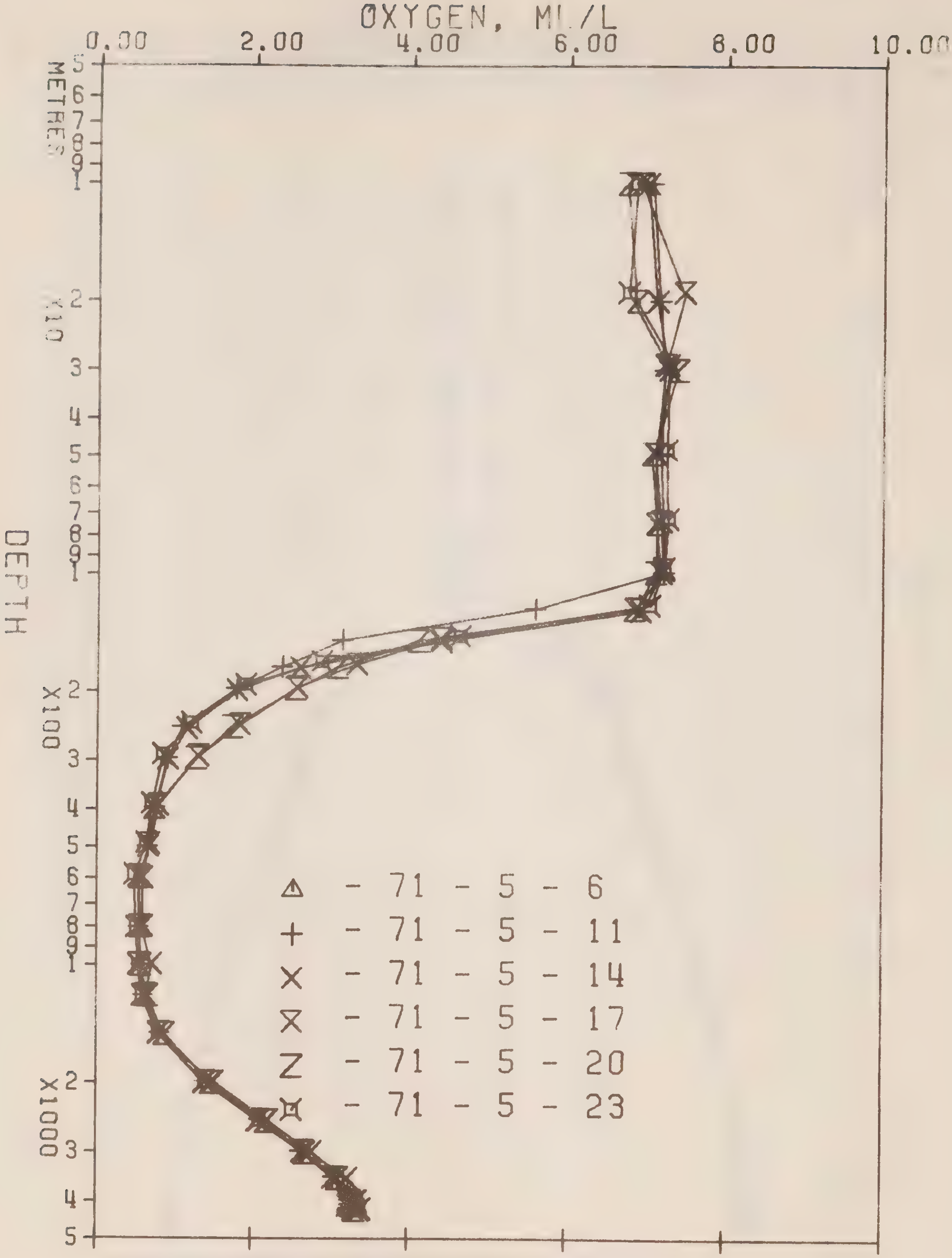


Fig. 14 Composite plot of oxygen vs $\log_{10}$ depth P-71-5.

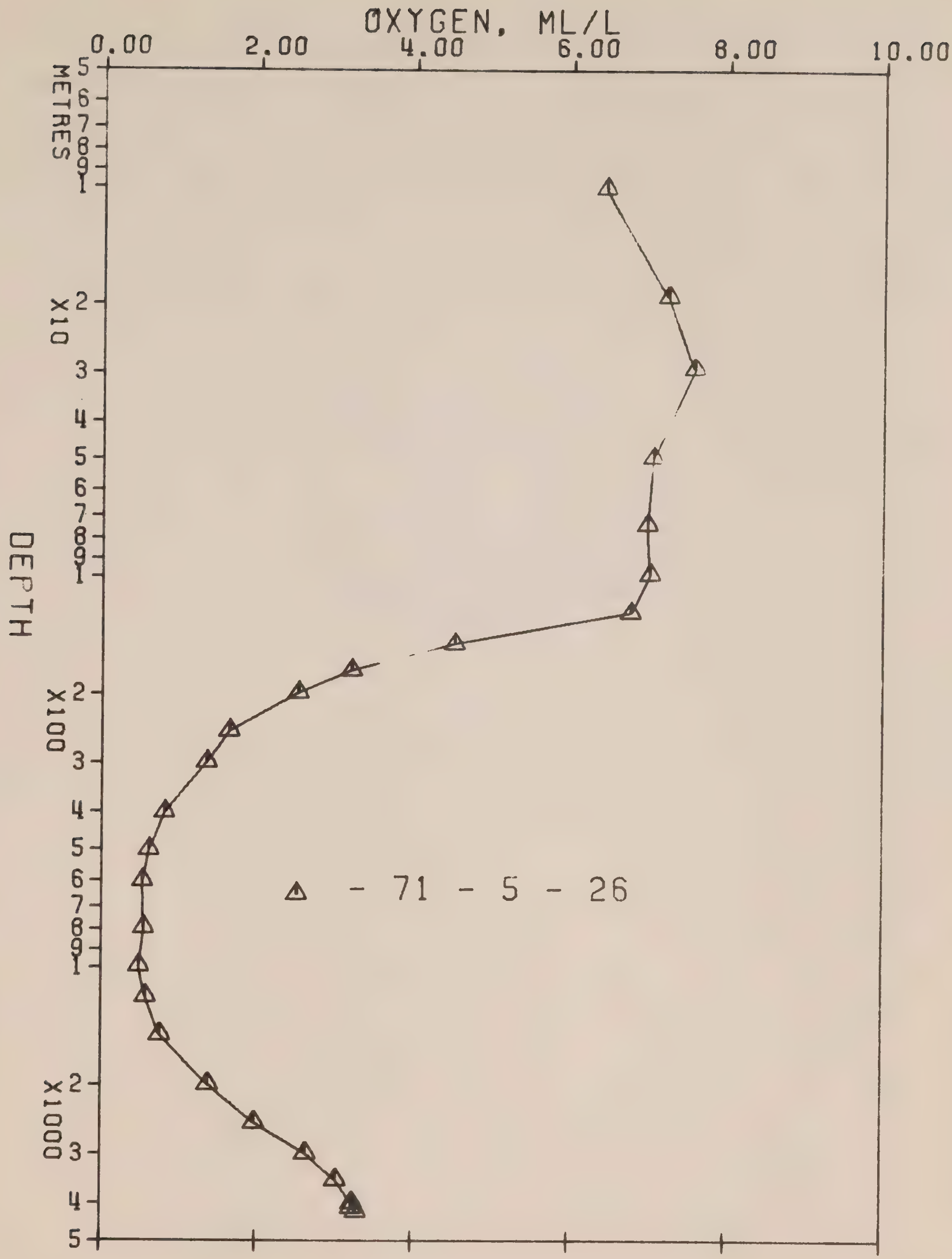
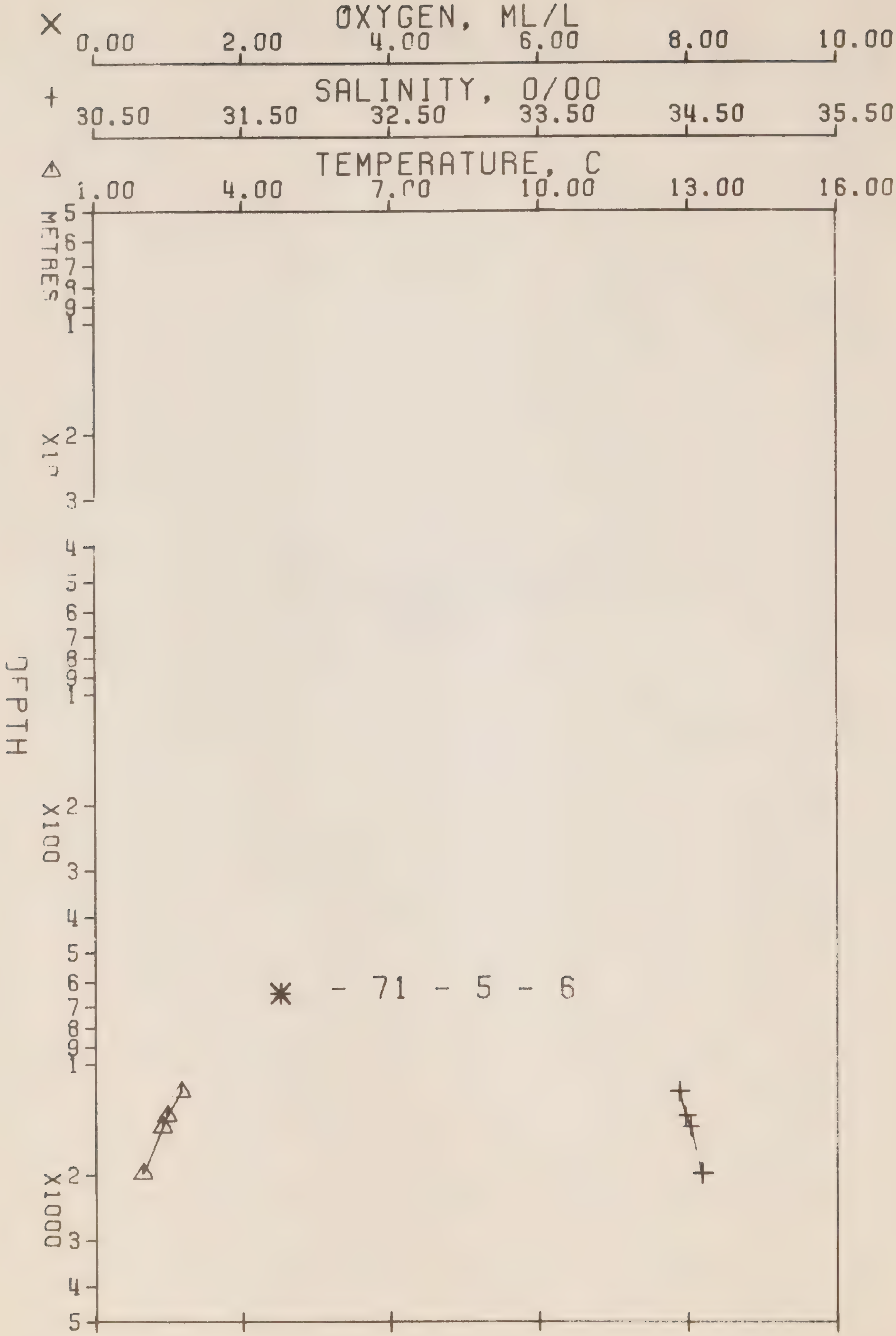


Fig. 15 Composite plot of oxygen vs $\log_{10}$ depth P-71-5.

RESULTS OF BOTTLE CASTS

(P-71-5)



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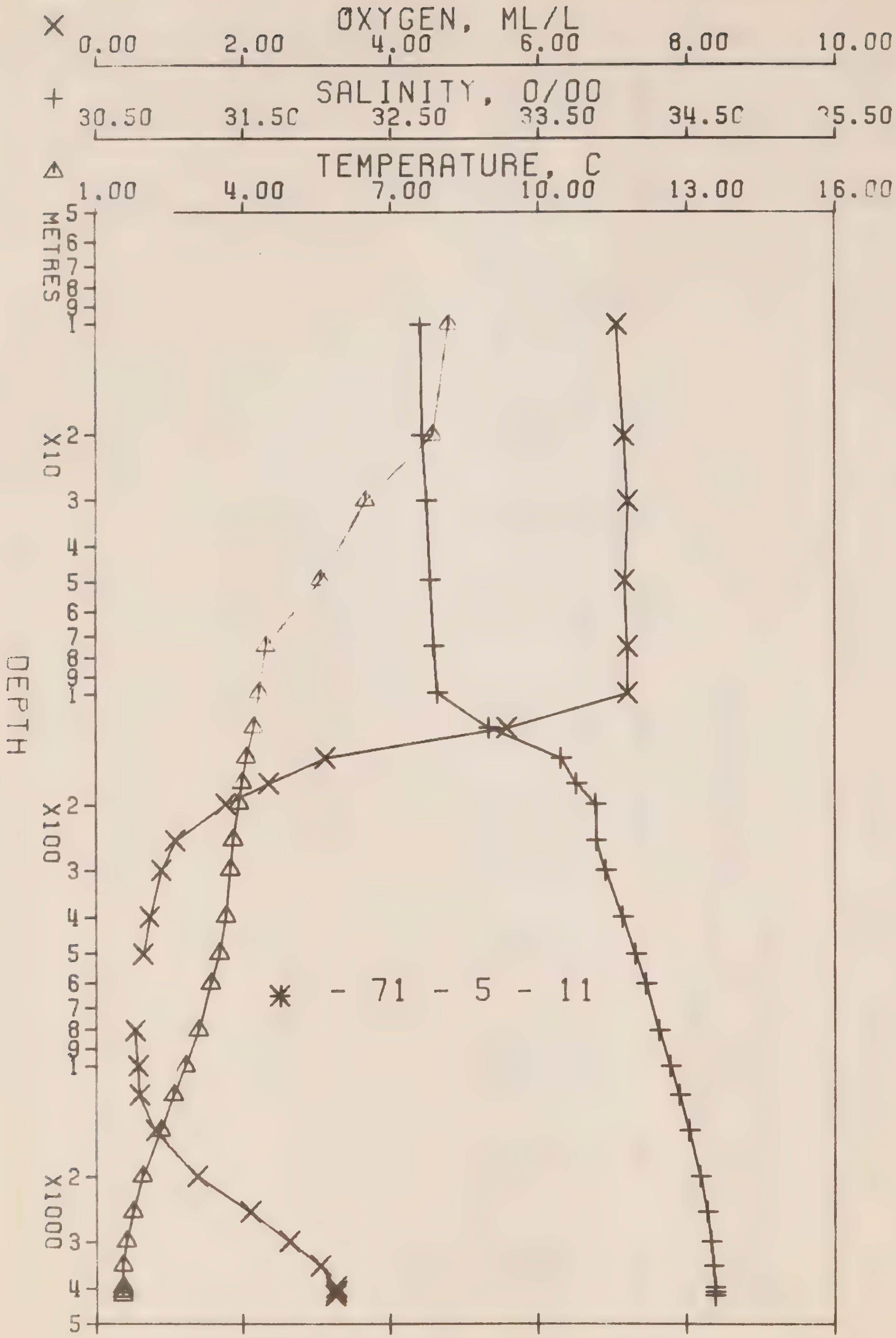
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH
METRES
X10
X100
X1000
- 71 - 5 - 6

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 6 DATE 27/ 6/71
POSITION 49-26.0 N, 136-40.0 W GMT 12.5
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	10.18	32.632	0	25.099	287.6	10.18	287.4	0.0	0.0	0.0	1488.
1200	2.73	34.442	1189	27.489	67.7	2.65	59.7	19.79	53.63	0.0	1480.
1398	2.44	34.487	1384	27.550	62.3	2.35	53.9	21.07	70.65	0.0	1482.
1497	2.35	34.515	1482	27.580	59.7	2.25	51.0	21.67	79.59	0.0	1484.
2000	1.94	34.594	1977	27.676	51.2	1.80	41.7	24.43	128.67	0.0	1491.



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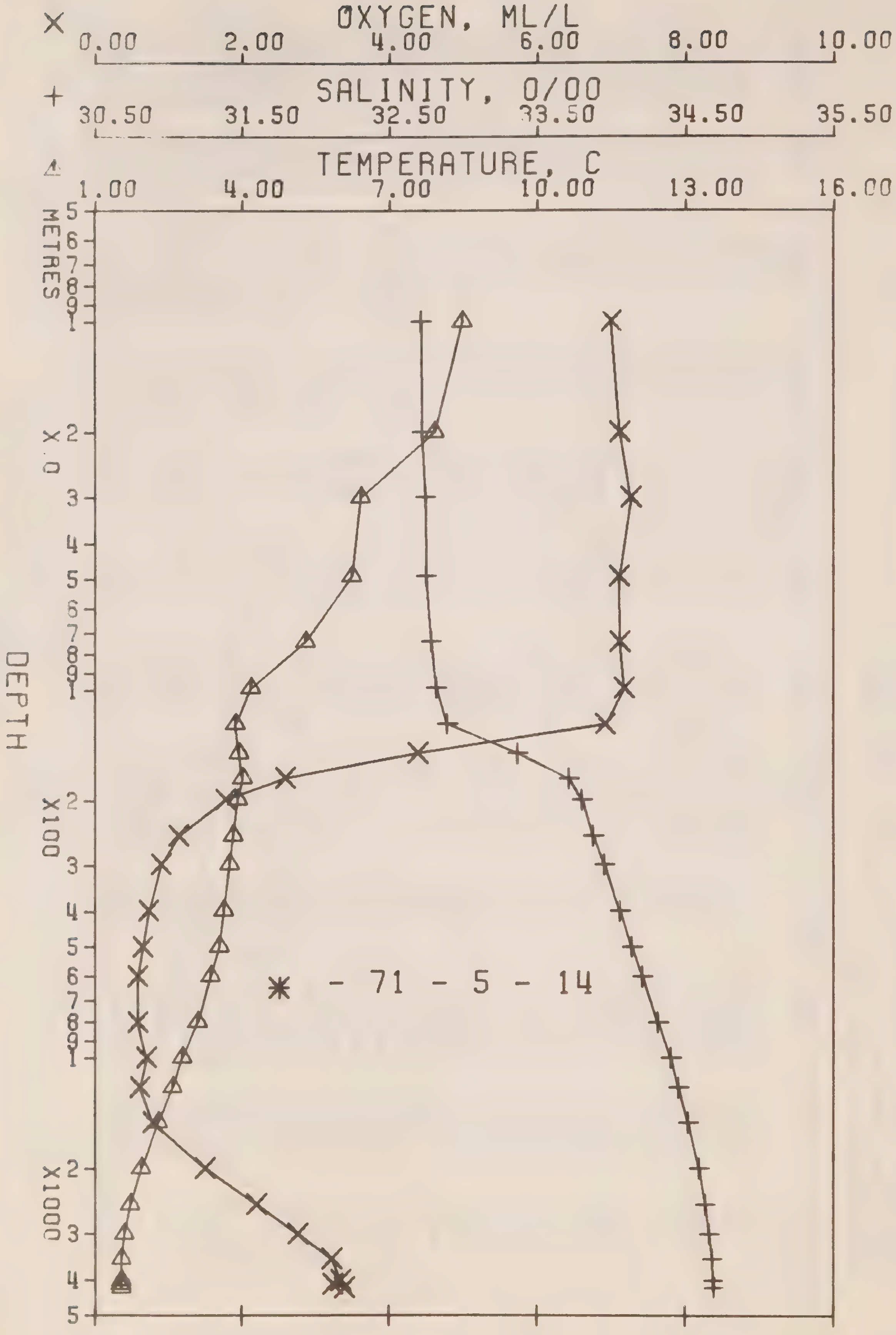
2.00
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.5C
32.50
33.50
34.5C
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
METRES
X10
X100
X1000
DEPTH
- 71 - 5 - 11

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 11 DATE 29/ 6/71
POSITION 49-58.0 N, 145- 3.0 W GMT 20.1
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	8.21	32.710	0	25.471	252.1	8.21	251.9	0.0	0.0	7.03	1481.
10	8.19	32.710	10	25.474	252.0	8.19	251.6	0.25	0.01	7.06	1481.
20	7.86	32.721	20	25.531	246.8	7.86	246.2	0.51	0.05	7.16	1480.
30	6.49	32.750	30	25.740	226.9	6.49	226.3	0.74	0.11	7.21	1475.
49	5.58	32.775	49	25.872	214.5	5.58	213.7	1.16	0.28	7.17	1471.
74	4.46	32.801	74	26.017	200.7	4.45	199.9	1.68	0.61	7.21	1467.
100	4.33	32.823	99	26.048	198.0	4.32	196.9	2.19	1.06	7.21	1467.
124	4.23	33.175	123	26.338	170.7	4.22	169.4	2.64	1.57	5.58	1467.
149	4.08	33.662	148	26.739	132.9	4.07	131.3	3.02	2.10	3.12	1468.
174	3.99	33.765	173	26.830	124.5	3.98	122.6	3.34	2.63	2.35	1468.
198	3.93	33.896	197	26.941	114.2	3.92	112.2	3.63	3.17	1.77	1468.
249	3.80	33.894	247	26.952	113.4	3.78	111.1	4.19	4.47	1.08	1469.
299	3.75	33.961	297	27.010	108.3	3.73	105.5	4.75	6.03	0.89	1469.
400	3.66	34.073	397	27.108	99.8	3.63	96.2	5.80	9.77	0.73	1471.
503	3.52	34.159	499	27.190	92.7	3.49	88.4	6.79	14.32	0.64	1472.
607	3.34	34.228	602	27.262	86.5	3.30	81.5	7.72	19.59	0.0	1473.
809	3.08	34.322	802	27.362	78.1	3.02	71.9	9.38	31.56	0.53	1475.
1011	2.82	34.396	1001	27.444	71.0	2.75	64.1	10.87	45.46	0.57	1478.
1211	2.58	34.455	1199	27.512	65.2	2.50	57.6	12.24	60.91	0.59	1480.
1514	2.31	34.518	1497	27.585	59.1	2.21	50.4	14.11	86.89	0.81	1484.
2017	1.93	34.594	1992	27.676	51.3	1.79	41.6	16.86	136.38	1.38	1491.
2520	1.73	34.638	2486	27.727	47.3	1.55	36.6	19.32	193.36	2.10	1498.
3025	1.60	34.664	2981	27.758	45.3	1.38	33.4	21.65	259.26	2.63	1506.
3534	1.53	34.680	3478	27.776	44.6	1.26	31.4	23.93	335.41	3.05	1515.
4045	1.52	34.688	3977	27.783	45.2	1.19	30.4	26.23	423.98	3.26	1524.
4148	1.52	34.689	4077	27.783	45.4	1.18	30.2	26.69	443.40	3.26	1525.
4251	1.53	34.692	4178	27.785	45.7	1.18	30.0	27.16	463.63	3.25	1527.



× OXYGEN, ML/L
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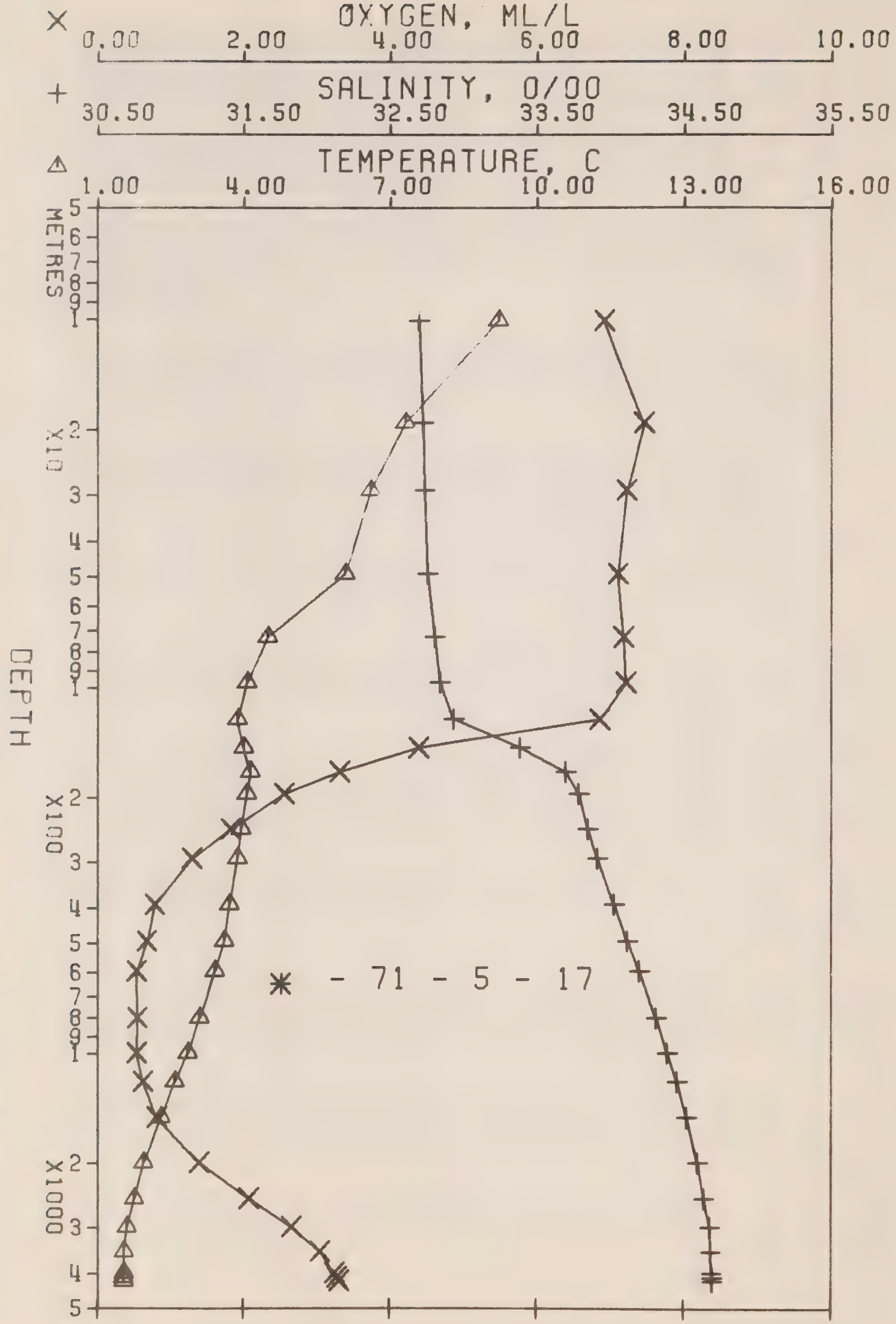
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
METRES
X.0
X100
X1000
DEPTH
✳ - 71 - 5 - 14

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 14 DATE 5/ 7/71
POSITION 50- 2.0 N, 144-58.0 W GMT 20.2
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	8.82	32.719	0	25.386	260.2	8.82	260.0	0.0	0.0	6.88	1483.
10	8.48	32.721	10	25.439	255.3	8.48	254.9	0.26	0.01	7.00	1482.
20	7.91	32.723	20	25.525	247.3	7.91	246.7	0.51	0.05	7.12	1480.
30	6.41	32.750	30	25.750	225.9	6.41	225.3	0.75	0.11	7.27	1474.
49	6.23	32.753	49	25.775	223.8	6.23	223.0	1.18	0.29	7.11	1474.
74	5.29	32.788	74	25.916	210.6	5.28	209.5	1.72	0.63	7.12	1470.
100	4.18	32.826	99	26.066	196.3	4.17	195.3	2.24	1.09	7.18	1466.
125	3.86	32.901	124	26.157	187.8	3.85	186.6	2.72	1.64	6.92	1465.
150	3.94	33.377	149	26.527	152.8	3.93	151.4	3.15	2.25	4.39	1467.
175	4.02	33.718	174	26.790	128.3	4.01	126.5	3.50	2.83	2.59	1468.
200	3.91	33.810	199	26.874	120.5	3.90	118.5	3.81	3.42	1.78	1468.
251	3.82	33.887	249	26.945	114.2	3.80	111.8	4.40	4.77	1.14	1469.
301	3.74	33.960	299	27.010	108.3	3.72	105.5	4.96	6.35	0.90	1469.
402	3.63	34.066	399	27.106	100.0	3.60	96.4	6.01	10.11	0.73	1471.
504	3.54	34.144	500	27.176	94.1	3.51	89.6	7.00	14.67	0.65	1472.
605	3.36	34.213	600	27.249	87.7	3.32	82.8	7.92	19.86	0.58	1473.
805	3.08	34.321	798	27.361	78.2	3.03	72.0	9.57	31.76	0.58	1475.
1008	2.77	34.406	998	27.456	69.7	2.70	62.9	11.06	45.53	0.70	1477.
1209	2.57	34.457	1197	27.515	64.9	2.49	57.3	12.41	60.83	0.61	1480.
1511	2.28	34.520	1494	27.589	58.6	2.18	50.1	14.27	86.54	0.79	1484.
2014	1.93	34.594	1989	27.676	51.2	1.79	41.6	17.01	135.72	1.50	1491.
2529	1.71	34.635	2495	27.726	47.3	1.53	36.7	19.53	194.17	2.20	1498.
3046	1.59	34.662	3001	27.757	45.3	1.36	33.4	21.91	261.85	2.76	1507.
3561	1.53	34.678	3505	27.774	44.8	1.25	31.6	24.23	339.76	3.22	1515.
4075	1.52	34.686	4006	27.781	45.5	1.19	30.5	26.54	430.00	3.34	1524.
4177	1.51	34.687*	4105	27.783	45.5	1.17	30.3	27.01	449.43	3.23	1526.
4278	1.53	34.689	4204	27.783	45.9	1.17	30.2	27.47	469.45	3.39	1528.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SALINITY, 0/00
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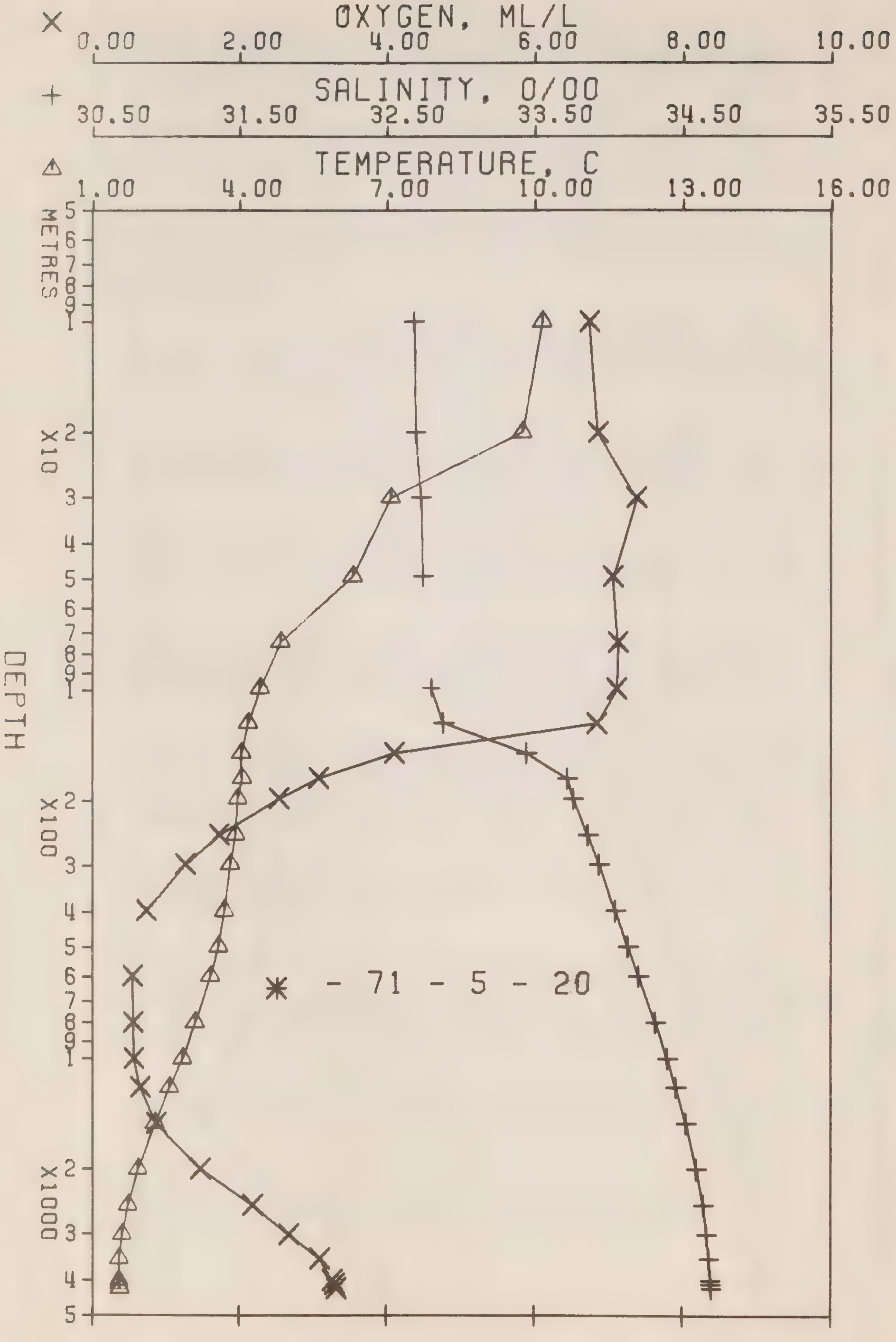
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH
METRES
X10
X100
X1000
* - 71 - 5 - 17

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 17 DATE 12/ 7/71
POSITION 49-58.0 N, 144-58.0 W GMT 20.2
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	9.36	32.702	0	25.288	269.5	9.36	269.3	0.0	0.0	6.92	1485.
10	9.22	32.704	10	25.312	267.4	9.22	267.0	0.27	0.01	6.92	1485.
19	7.31	32.732	19	25.617	238.6	7.31	238.0	0.50	0.05	7.46	1478.
29	6.59	32.741	29	25.720	228.8	6.59	228.2	0.73	0.11	7.22	1475.
49	6.07	32.758	49	25.799	221.5	6.07	220.6	1.19	0.29	7.10	1473.
73	4.48	32.812	73	26.024	200.1	4.47	199.3	1.70	0.60	7.18	1467.
98	4.06	32.844	97	26.092	193.8	4.05	192.8	2.17	1.02	7.21	1466.
123	3.86	32.941	122	26.189	184.7	3.85	183.5	2.65	1.56	6.85	1465.
147	4.00	33.391	146	26.533	152.4	3.99	151.0	3.06	2.12	4.39	1467.
171	4.14	33.698	170	26.762	131.0	4.13	129.1	3.40	2.67	3.31	1468.
196	4.06	33.789	195	26.842	123.5	4.05	121.5	3.72	3.27	2.55	1469.
246	3.94	33.851	244	26.904	118.1	3.92	115.7	4.31	4.61	1.82	1469.
295	3.86	33.915	293	26.963	112.8	3.84	110.1	4.88	6.18	1.29	1470.
395	3.70	34.028	392	27.068	103.5	3.67	99.9	5.96	9.97	0.78	1471.
497	3.59	34.118	493	27.151	96.5	3.56	92.1	6.98	14.60	0.67	1472.
600	3.40	34.200	595	27.234	89.1	3.36	84.1	7.93	19.94	0.53	1473.
805	3.09	34.317	798	27.357	78.6	3.04	72.5	9.64	32.19	0.54	1475.
1007	2.84	34.391	997	27.438	71.6	2.77	64.6	11.15	46.12	0.53	1478.
1208	2.58	34.453	1196	27.511	65.4	2.50	57.6	12.53	61.67	0.62	1480.
1512	2.29	34.519	1495	27.588	58.8	2.19	50.2	14.40	87.65	0.81	1484.
2017	1.93	34.594	1992	27.676	51.2	1.79	41.6	17.15	137.15	1.39	1491.
2524	1.73	34.635	2490	27.725	47.5	1.55	36.8	19.64	194.88	2.07	1498.
3033	1.59	34.676	2989	27.768	44.3	1.37	32.5	21.97	260.71	2.65	1507.
3546	1.53	34.679	3490	27.775	44.7	1.25	31.5	24.24	336.89	3.04	1515.
4063	1.52	34.685	3994	27.780	45.5	1.19	30.6	26.58	427.63	3.24	1524.
4166	1.51	34.689	4095	27.784	45.4	1.17	30.1	27.05	447.38	3.27	1526.
4270	1.53	34.689	4196	27.783	45.9	1.18	30.2	27.52	467.72	3.30	1527.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6.00
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10.00
SALINITY, 0/00
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31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
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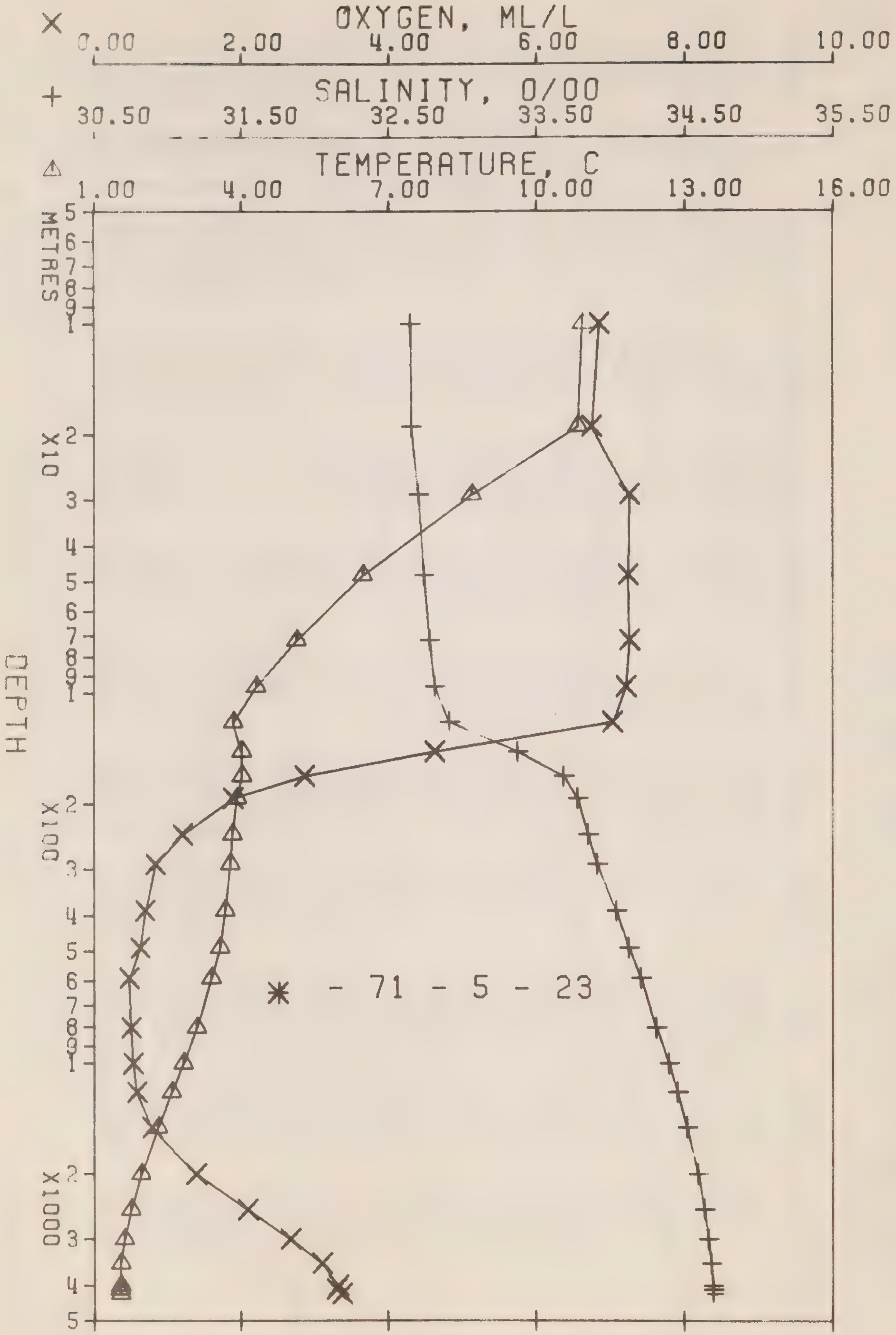
4.00
7.00
10.00
13.00
16.00
METRES
X10
X100
X1000
DEPTH
* - 71 - 5 - 20

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 20 DATE 19/ 7/71
POSITION 49-57.0 N, 145- 0.0 W GMT 19.8
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	10.23	32.689	0	25.135	284.1	10.23	283.9	0.0	0.0	6.70	1488.
10	10.15	32.691	10	25.150	282.9	10.15	282.5	0.29	0.01	6.74	1488.
20	9.74	32.701	20	25.226	275.9	9.74	275.2	0.57	0.06	6.86	1487.
30	7.07	32.735	30	25.652	235.4	7.07	234.6	0.83	0.12	7.38	1477.
49	6.29	32.750	49	25.765	224.7	6.29	223.9	1.26	0.30	7.06	1474.
74	4.82	32.767*	74	25.952	207.1	4.81	206.1	1.80	0.64	7.13	1469.
100	4.40	32.807	99	26.028	199.9	4.39	198.9	2.31	1.10	7.11	1467.
124	4.16	32.888	123	26.117	191.7	4.15	190.4	2.79	1.64	6.84	1467.
149	4.03	33.449	148	26.576	148.4	4.02	146.9	3.22	2.24	4.10	1467.
174	4.05	33.725	173	26.793	128.0	4.04	126.3	3.56	2.80	3.07	1468.
198	3.96	33.767	197	26.835	124.2	3.95	122.2	3.86	3.38	2.53	1468.
249	3.91	33.866	247	26.919	116.7	3.89	114.2	4.47	4.76	1.72	1469.
299	3.80	33.941	297	26.989	110.3	3.78	107.5	5.04	6.35	1.26	1469.
400	3.68	34.049	397	27.087	101.8	3.65	98.2	6.11	10.16	0.73	1471.
501	3.56	34.137	497	27.169	94.8	3.53	90.4	7.10	14.71	0.0	1472.
604	3.40	34.204	599	27.238	88.9	3.36	83.8	8.04	20.03	0.54	1473.
808	3.09	34.318	801	27.357	78.5	3.03	72.4	9.75	32.29	0.55	1475.
1012	2.83	34.399	1002	27.446	71.0	2.76	63.9	11.26	46.35	0.56	1478.
1214	2.56	34.457	1202	27.515	64.8	2.48	57.2	12.63	61.92	0.65	1480.
1519	2.26	34.526	1502	27.596	57.9	2.16	49.5	14.49	87.80	0.87	1484.
2028	1.92	34.594	2003	27.677	51.2	1.78	41.6	17.24	137.55	1.47	1491.
2539	1.70	34.638	2505	27.729	47.0	1.52	36.3	19.73	195.55	2.18	1499.
3051	1.59	34.660	3006	27.755	45.5	1.36	33.6	22.09	262.63	2.67	1507.
3564	1.53	34.676	3508	27.772	45.0	1.25	31.6	24.40	340.67	3.09	1515.
4079	1.53	34.683	4010	27.778	45.8	1.20	30.8	26.74	431.82	3.26	1524.
4183	1.52	34.686	4111	27.781	45.8	1.18	30.5	27.21	451.80	3.29	1526.
4285	1.54	34.688	4211	27.781	46.2	1.18	30.3	27.69	472.17	3.31	1528.



X OXYGEN, ML/L
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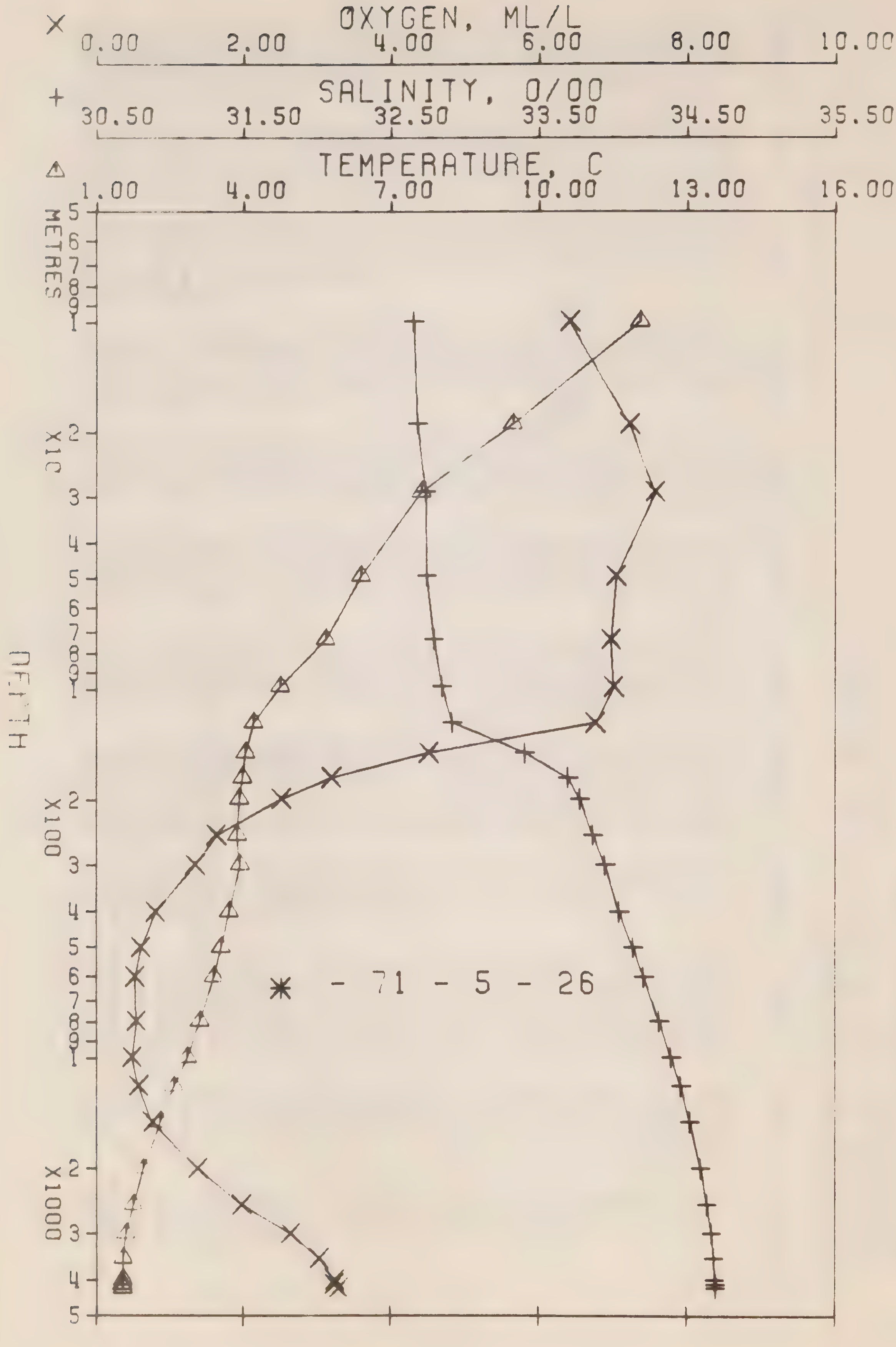
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
METRES
X10
X100
X1000
DEPTH
* - 71 - 5 - 23

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 23 DATE 26/ 7/71
POSITION 50- 0.0 N, 144-58.0 W GMT 20.2
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	10.98	32.652	0	24.976	299.2	10.98	299.0	0.0	0.0	6.87	1491.
10	10.93	32.655	10	24.988	298.3	10.93	297.9	0.30	0.02	6.85	1491.
19	10.84	32.660	19	25.007	296.7	10.84	296.0	0.57	0.06	6.75	1491.
29	8.69	32.710	29	25.399	259.5	8.69	258.7	0.85	0.12	7.26	1483.
48	6.48	32.744	48	25.737	227.5	6.48	226.6	1.31	0.31	7.24	1475.
72	5.12	32.787	72	25.934	208.7	5.11	207.8	1.83	0.63	7.26	1470.
97	4.30	32.820	96	26.049	197.9	4.29	196.9	2.32	1.05	7.21	1467.
121	3.84	32.921	120	26.175	186.0	3.83	184.9	2.79	1.57	7.03	1465.
145	4.02	33.382	144	26.523	153.3	4.01	151.9	3.20	2.13	4.63	1467.
169	4.02	33.691	168	26.769	130.3	4.01	128.5	3.54	2.67	2.86	1468.
194	3.91	33.786	193	26.855	122.2	3.90	120.3	3.86	3.25	1.89	1468.
243	3.82	33.853	241	26.917	116.6	3.80	114.4	4.43	4.53	1.20	1469.
292	3.77	33.917	290	26.973	111.8	3.75	109.1	4.99	6.07	0.83	1469.
392	3.67	34.044	389	27.084	102.0	3.64	98.5	6.06	9.79	0.69	1471.
493	3.57	34.129	489	27.162	95.4	3.54	91.1	7.06	14.28	0.63	1472.
595	3.39	34.209	590	27.243	88.3	3.35	83.4	7.99	19.47	0.47	1473.
809	3.08	34.317	802	27.358	78.5	3.02	72.4	9.77	32.20	0.50	1475.
1012	2.82	34.399	1002	27.446	70.9	2.75	63.8	11.28	46.18	0.53	1478.
1213	2.58	34.453	1201	27.511	65.4	2.50	57.6	12.65	61.72	0.58	1480.
1516	2.29	34.518	1499	27.587	58.9	2.19	50.3	14.52	87.76	0.79	1484.
2021	1.95	34.593	1996	27.674	51.5	1.81	41.8	17.28	137.59	1.39	1491.
2528	1.73	34.636	2494	27.725	47.5	1.55	36.7	19.78	195.43	2.09	1499.
3038	1.60	34.662	2994	27.756	45.4	1.37	33.5	22.14	262.42	2.67	1507.
3554	1.53	34.680	3498	27.776	44.7	1.25	31.4	24.45	340.20	3.10	1515.
4077	1.52	34.690	4008	27.784	45.2	1.19	30.2	26.80	431.51	3.32	1524.
4183	1.51	34.690	4111	27.785	45.3	1.17	30.0	27.28	451.65	3.29	1526.
4288	1.53	34.692	4214	27.785	45.8	1.17	29.9	27.76	472.45	3.38	1528.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32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
METRES
X10
X100
X1000
DEPTH
- 71 - 5 - 26

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 26 DATE 5/ 8/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 18.9
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	12.06	32.658	0	24.785	317.4	12.06	317.2	0.0	0.0	6.46	1495.
10	12.04	32.658	10	24.788	317.3	12.04	316.9	0.32	0.02	6.42	1495.
19	9.47	32.686	19	25.258	272.8	9.47	272.2	0.59	0.06	7.23	1486.
29	7.62	32.740	29	25.580	242.2	7.62	241.5	0.85	0.12	7.57	1479.
49	6.38	32.743	49	25.749	226.3	6.38	225.5	1.31	0.31	7.04	1474.
73	5.67	32.794	73	25.876	214.4	5.66	213.4	1.84	0.64	6.97	1472.
99	4.74	32.848	98	26.025	200.4	4.73	199.2	2.36	1.10	7.01	1469.
124	4.19	32.922	123	26.141	189.4	4.18	188.2	2.86	1.66	6.76	1467.
149	4.03	33.412	148	26.546	151.2	4.02	149.7	3.29	2.25	4.51	1467.
174	3.97	33.700	173	26.781	129.1	3.96	127.3	3.64	2.83	3.19	1468.
199	3.91	33.780	198	26.850	122.7	3.90	120.7	3.95	3.43	2.51	1468.
250	3.87	33.871	248	26.927	115.9	3.85	113.5	4.55	4.80	1.63	1469.
300	3.93	33.952	298	26.985	110.9	3.91	107.9	5.12	6.40	1.34	1470.
403	3.70	34.047	400	27.084	102.2	3.67	98.5	6.21	10.33	0.80	1471.
505	3.54	34.139	501	27.172	94.4	3.51	90.1	7.22	14.96	0.60	1472.
607	3.39	34.208	602	27.242	88.4	3.35	83.4	8.15	20.24	0.52	1473.
799	3.10	34.314	792	27.353	78.8	3.05	72.7	9.75	31.71	0.54	1475.
1002	2.84	34.396	992	27.442	71.2	2.77	64.2	11.26	45.61	0.48	1478.
1203	2.57	34.459	1191	27.516	64.8	2.49	57.1	12.63	60.97	0.57	1480.
1508	2.29	34.521	1491	27.589	58.6	2.19	50.1	14.50	86.77	0.76	1484.
2014	1.94	34.594	1989	27.676	51.3	1.80	41.7	17.25	136.24	1.38	1491.
2523	1.73	34.636	2489	27.725	47.4	1.55	36.7	19.75	194.04	1.98	1498.
3033	1.59	34.664	2989	27.758	45.2	1.37	33.4	22.10	260.68	2.64	1506.
3548	1.53	34.680	3492	27.776	44.7	1.25	31.4	24.41	337.90	3.03	1515.
4066	1.52	34.686	3997	27.781	45.4	1.19	30.5	26.74	428.54	3.24	1524.
4169	1.51	34.689	4098	27.784	45.4	1.17	30.1	27.21	448.29	3.23	1526.
4274	1.53	34.691	4200	27.784	45.8	1.18	30.0	27.69	468.83	3.29	1528.

RESULTS OF STD CASTS

(P-71-5)

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 1 DATE 25/ 6/71
POSITION 48-33.0N, 125-33.0W GMT 23.1
RESULTS OF STP CAST 24 POINTS TAKEN FROM ANALOG TRACE

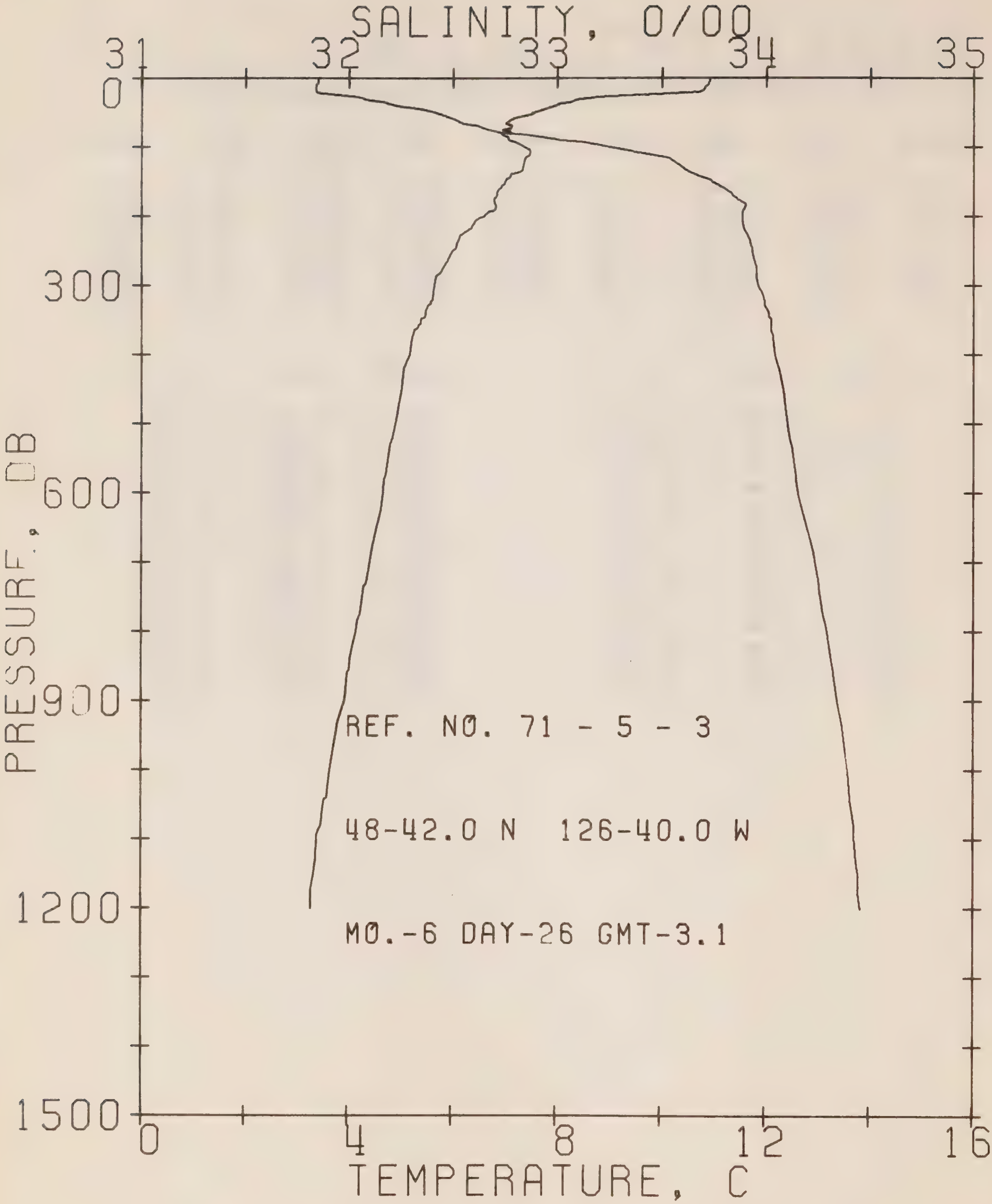
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.90	31.78	0	24.31	362.1	0.0	0.0	1490.
10	10.90	31.78	10	24.31	362.5	0.36	0.02	1490.
20	10.85	31.78	20	24.32	361.9	0.72	0.07	1490.
30	9.26	32.17	30	24.89	308.0	1.07	0.16	1485.
50	7.56	33.04	50	25.82	219.4	1.59	0.37	1479.
75	6.71	33.70	75	26.46	159.3	2.05	0.66	1477.

DEPTH	TEMP	SAL	DEPTH	TEMP	SAL
0.	10.90	31.78	39.	8.09	32.70
10.	10.90	31.78	44.	7.93	32.77
12.	10.90	31.78	50.	7.56	33.04
20.	10.85	31.78	53.	7.41	33.13
22.	10.85	31.79	55.	7.38	33.17
25.	10.76	31.79	56.	7.38	33.17
26.	10.56	31.79	62.	7.05	33.42
30.	9.26	32.17	65.	6.88	33.58
31.	9.08	32.20	68.	6.78	33.67
33.	8.93	32.34	70.	6.73	33.69
35.	8.50	32.52	75.	6.71	33.70
38.	8.28	32.66	90.	6.70	33.72

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 2 DATE 26/ 6/71
POSITION 48-37.0N, 125-58.0W GMT 0.6
RESULTS OF STP CAST 26 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.53	31.61	0	24.25	368.6	0.0	0.0	1488.
10	10.45	31.64	10	24.28	365.5	0.37	0.02	1488.
20	9.83	31.94	20	24.62	333.7	0.72	0.07	1486.
30	7.98	32.61	30	25.43	256.8	1.01	0.14	1480.
50	7.60	33.01	50	25.79	222.1	1.49	0.34	1480.
75	7.13	33.32	75	26.10	193.1	2.00	0.67	1479.

DEPTH	TEMP	SAL	DEPTH	TEMP	SAL
0.	10.53	31.61	43.	7.85	32.84
2.	10.48	31.62	46.	7.69	32.92
10.	10.45	31.64	48.	7.68	32.96
11.	10.44	31.65	50.	7.60	33.01
13.	10.45	31.67	57.	7.43	33.10
17.	10.12	31.79	58.	7.41	33.10
18.	10.08	31.82	60.	7.34	33.14
20.	9.83	31.94	64.	7.28	33.19
23.	8.48	32.29	65.	7.24	33.19
30.	7.98	32.61	75.	7.13	33.32
33.	7.95	32.65	80.	6.93	33.48
34.	7.90	32.71	84.	6.88	33.51
39.	7.90	32.77	90.	6.87	33.51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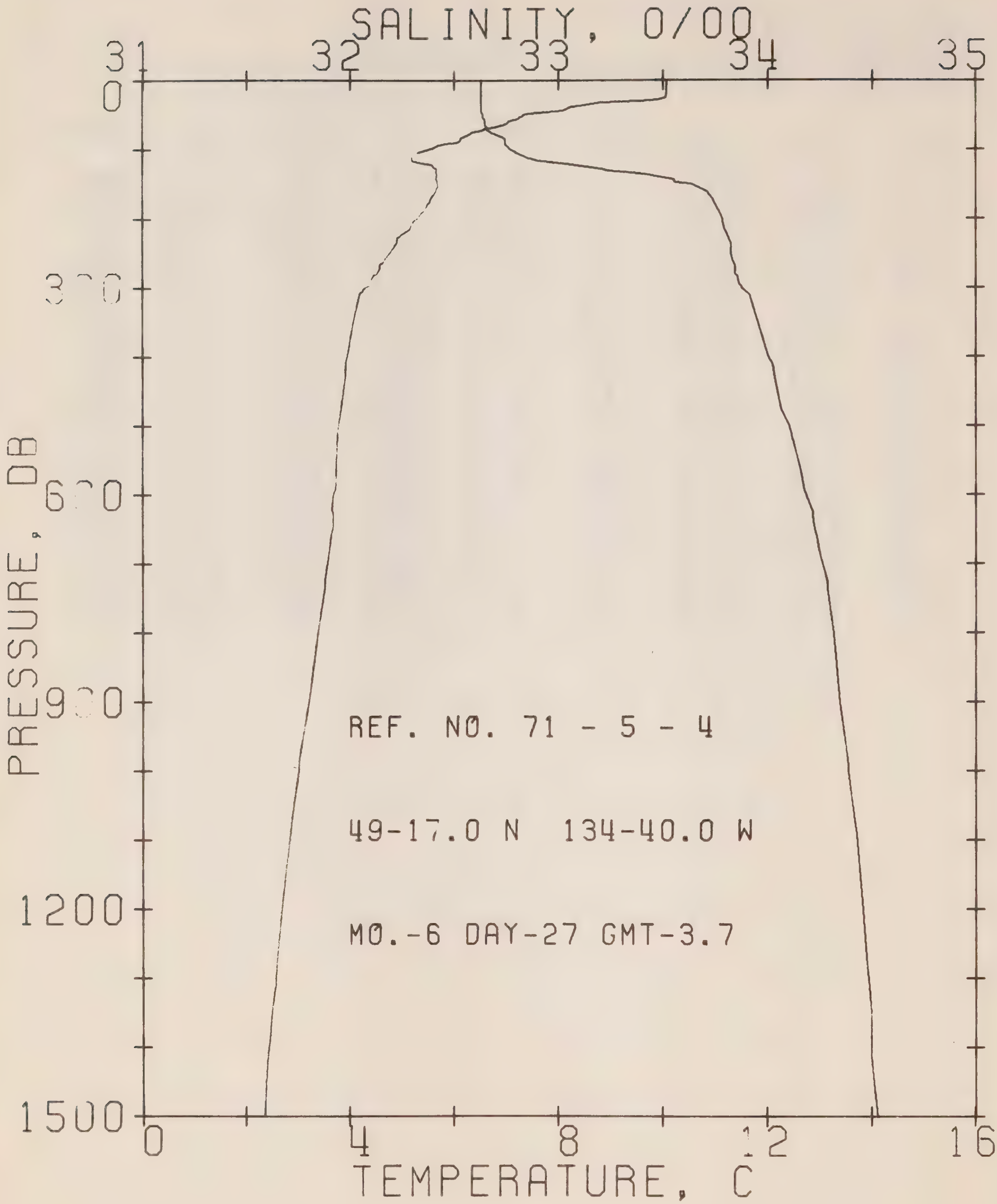
0
300
600
900
1200
1500
PRESSURE, DB
0
4
8
12
16
TEMPERATURE, C
REF. NO. 71 - 5 - 3
48-42.0 N 126-40.0 W
MO.-6 DAY-26 GMT-3.1

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 3 DATE 26/ 6/71
POSITION 48-42.0N, 126-40.0W GMT 3.1
RESULTS OF STP CAST 113 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.95	31.85	0	24.36	357.7	0.0	0.0	1490.
10	10.90	31.84	10	24.36	358.1	0.36	0.02	1490.
20	10.74	31.85	20	24.40	354.9	0.72	0.07	1489.
30	8.46	32.08	30	24.94	303.0	1.04	0.15	1481.
50	7.58	32.43	50	25.34	265.0	1.61	0.38	1479.
75	6.95	32.68	75	25.62	238.5	2.24	0.78	1477.
100	7.40	33.26	99	26.02	201.6	2.78	1.27	1480.
125	7.39	33.59	124	26.28	177.3	3.25	1.80	1481.
150	7.04	33.75	149	26.45	161.0	3.68	2.40	1480.
175	6.80	33.87	174	26.58	149.3	4.06	3.04	1480.
200	6.62	33.89	199	26.62	145.8	4.43	3.74	1479.
225	6.21	33.92	223	26.69	139.0	4.79	4.51	1478.
250	6.03	33.94	248	26.74	135.2	5.13	5.34	1478.
300	5.68	33.97	298	26.80	129.2	5.79	7.19	1477.
400	5.21	34.05	397	26.92	118.8	7.02	11.57	1477.
500	4.93	34.11	496	27.00	112.0	8.17	16.82	1478.
600	4.69	34.16	595	27.07	106.5	9.26	22.93	1478.
800	4.17	34.30	793	27.24	91.9	11.23	36.98	1480.
1000	3.67	34.40	991	27.37	80.3	12.95	52.71	1481.
1200	3.27	34.46	1188	27.45	72.6	14.47	69.75	1483.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300
600
900
1200
1500
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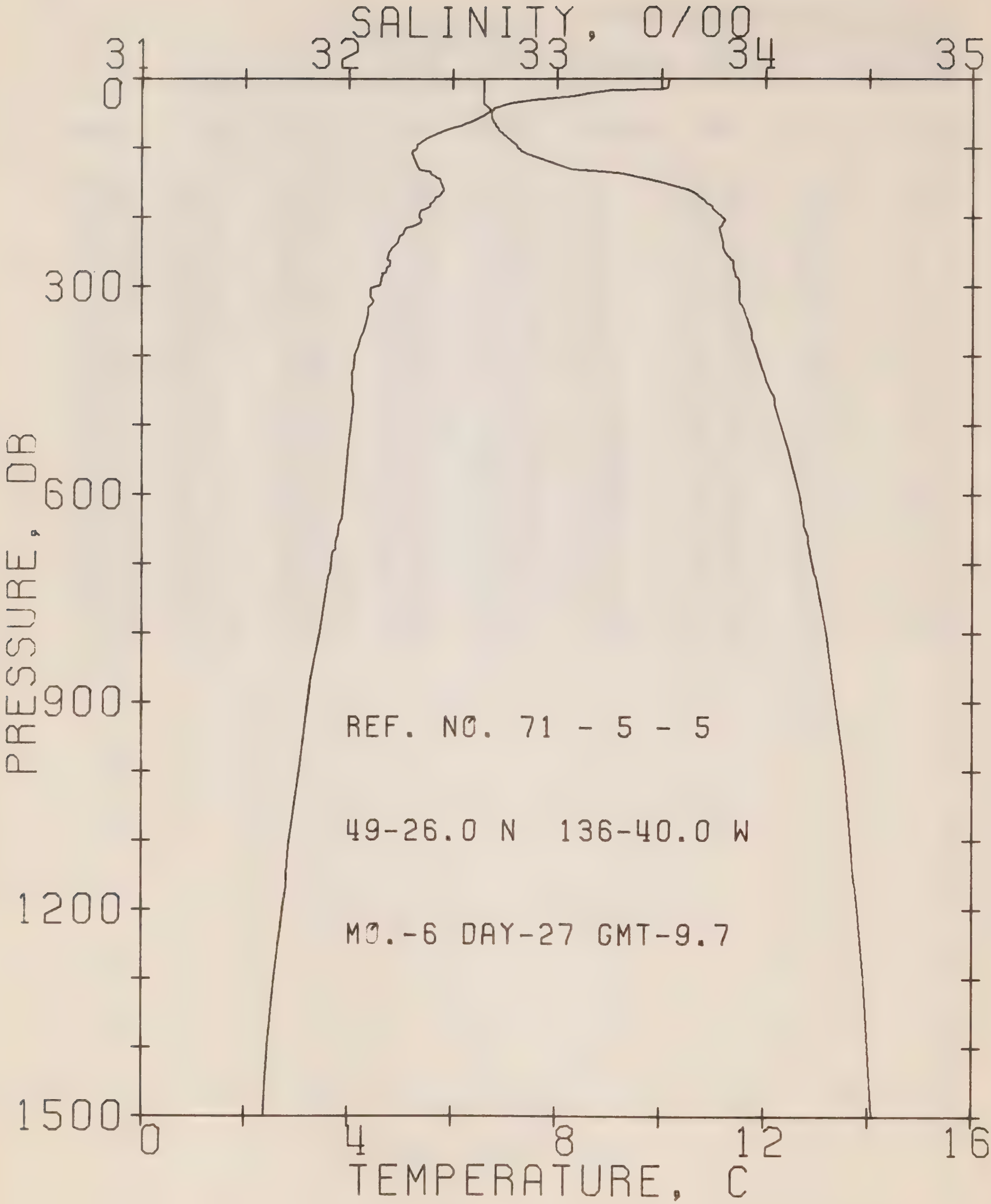
REF. NO. 71 - 5 - 4
49-17.0 N 134-40.0 W
MO.-6 DAY-27 GMT-3.7
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 4 DATE 27/ 6/71
POSITION 49-17.0N, 134-40.0W GMT 3.7
RESULTS OF STP CAST 98 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.09	32.63	0	25.11	286.0	0.0	0.0	1488.
10	10.09	32.63	10	25.11	286.4	0.29	0.01	1488.
20	10.09	32.63	20	25.11	286.6	0.57	0.06	1488.
30	9.58	32.63	30	25.20	278.8	0.86	0.13	1486.
50	7.35	32.64	50	25.54	246.4	1.38	0.34	1478.
75	6.39	32.68	75	25.70	231.5	1.98	0.72	1475.
100	5.55	32.78	99	25.88	214.3	2.53	1.22	1472.
125	5.61	33.14	124	26.16	188.3	3.04	1.80	1473.
150	5.69	33.64	149	26.54	152.2	3.46	2.39	1474.
175	5.58	33.75	174	26.64	143.0	3.83	3.00	1475.
200	5.33	33.79	199	26.70	137.3	4.18	3.67	1474.
225	4.99	33.82	223	26.76	131.8	4.52	4.40	1473.
250	4.80	33.83	248	26.80	128.8	4.84	5.18	1473.
300	4.33	33.88	298	26.89	120.4	5.47	6.93	1472.
400	3.98	34.01	397	27.03	107.9	6.59	10.94	1472.
500	3.80	34.11	496	27.12	99.3	7.63	15.70	1473.
600	3.69	34.19	595	27.20	92.9	8.60	21.09	1474.
800	3.40	34.32	793	27.33	81.6	10.33	33.45	1476.
1000	3.03	34.39	990	27.42	73.7	11.89	47.69	1478.
1200	2.69	34.46	1188	27.51	66.0	13.28	63.25	1480.
1500	2.33	34.53	1484	27.59	58.4	15.15	88.87	1484.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32
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34
35
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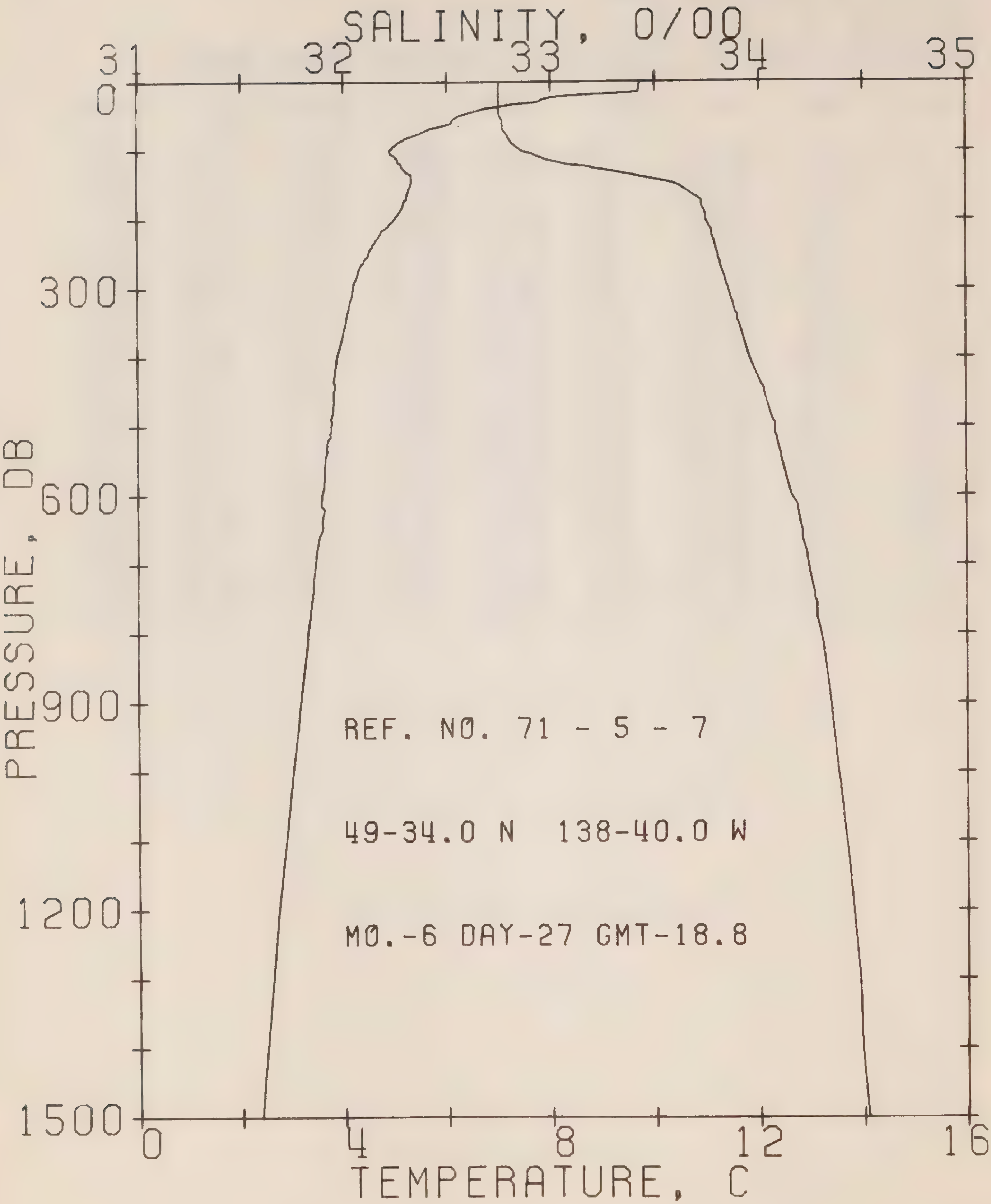
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 5
49-26.0 N 136-40.0 W
MO.-6 DAY-27 GMT-9.7
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 5 DATE 27/ 6/71
POSITION 49-26.0N, 136-40.0W GMT 9.7
RESULTS OF STP CAST 99 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.17	32.65	0	25.11	285.8	0.0	0.0	1488.
10	10.16	32.65	10	25.12	286.0	0.29	0.01	1488.
20	8.70	32.65	20	25.35	263.9	0.56	0.06	1483.
30	7.58	32.65	30	25.51	248.4	0.82	0.12	1479.
50	6.68	32.69	50	25.67	234.0	1.30	0.32	1476.
75	5.85	32.73	75	25.80	221.3	1.87	0.68	1473.
100	5.33	32.82	99	25.94	208.9	2.41	1.16	1471.
125	5.31	33.02	124	26.10	193.9	2.91	1.73	1472.
150	5.78	33.51	149	26.43	163.0	3.35	2.35	1475.
175	5.68	33.71	174	26.60	147.1	3.74	2.99	1475.
200	5.37	33.80	199	26.71	137.1	4.09	3.67	1474.
225	5.03	33.79	223	26.74	134.2	4.43	4.41	1473.
250	4.80	33.81	248	26.78	130.3	4.77	5.21	1473.
300	4.53	33.88	298	26.86	122.6	5.40	6.98	1472.
400	4.13	33.97	397	26.98	112.4	6.58	11.18	1473.
500	4.06	34.08	496	27.07	104.3	7.66	16.13	1474.
600	3.94	34.17	595	27.16	97.1	8.67	21.77	1475.
800	3.47	34.30	793	27.31	83.9	10.48	34.64	1477.
1000	3.06	34.39	990	27.42	74.1	12.05	49.04	1478.
1200	2.75	34.45	1188	27.49	67.4	13.47	64.88	1480.
1500	2.35	34.52	1484	27.58	59.3	15.35	90.75	1484.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32
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34
35
PRESSURE, DB
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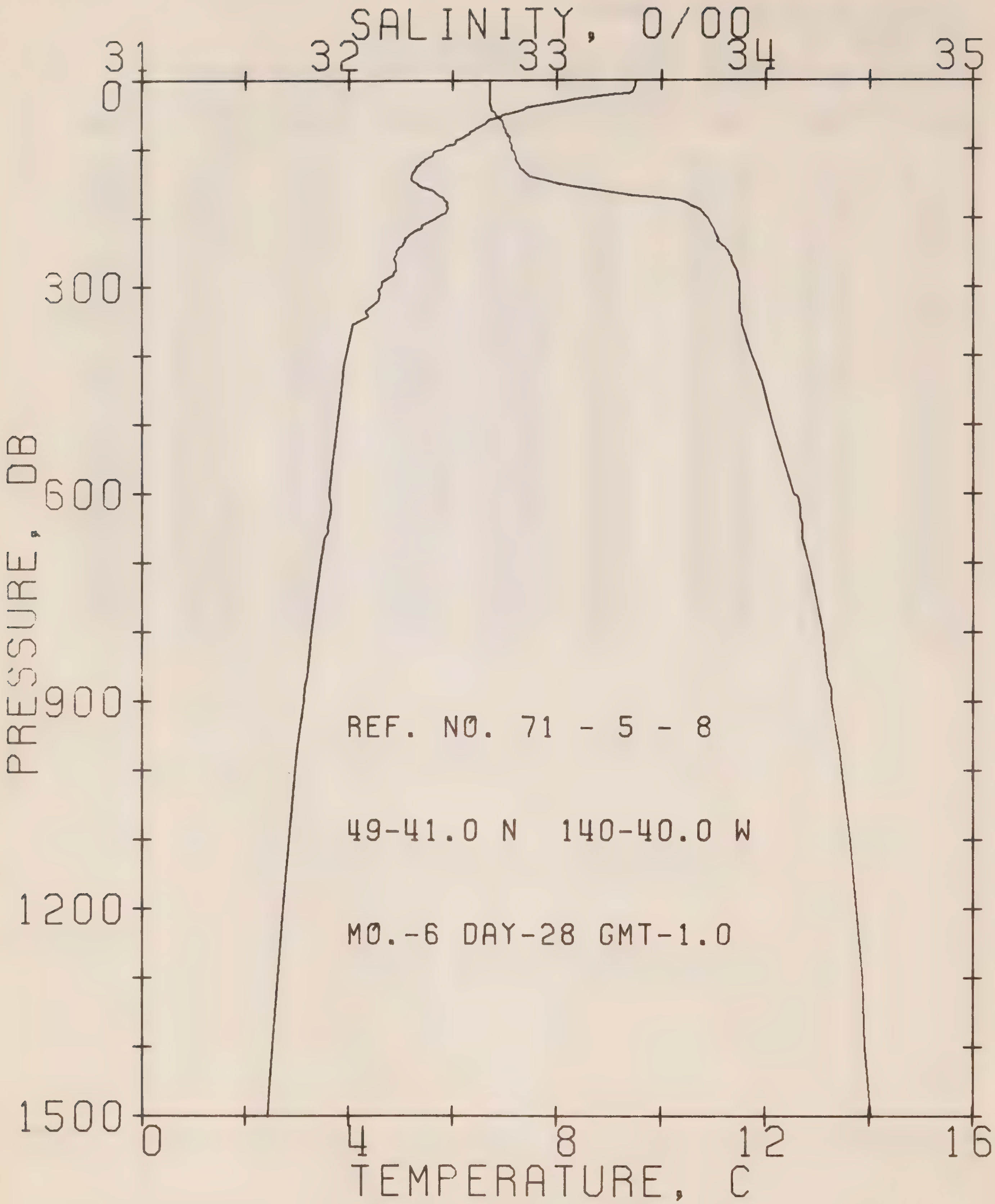
300
600
900
1200
1500
REF. NO. 71 - 5 - 7
49-34.0 N 138-40.0 W
MO.-6 DAY-27 GMT-18.8
0
4
8
12
16
TEMPERATURE, C

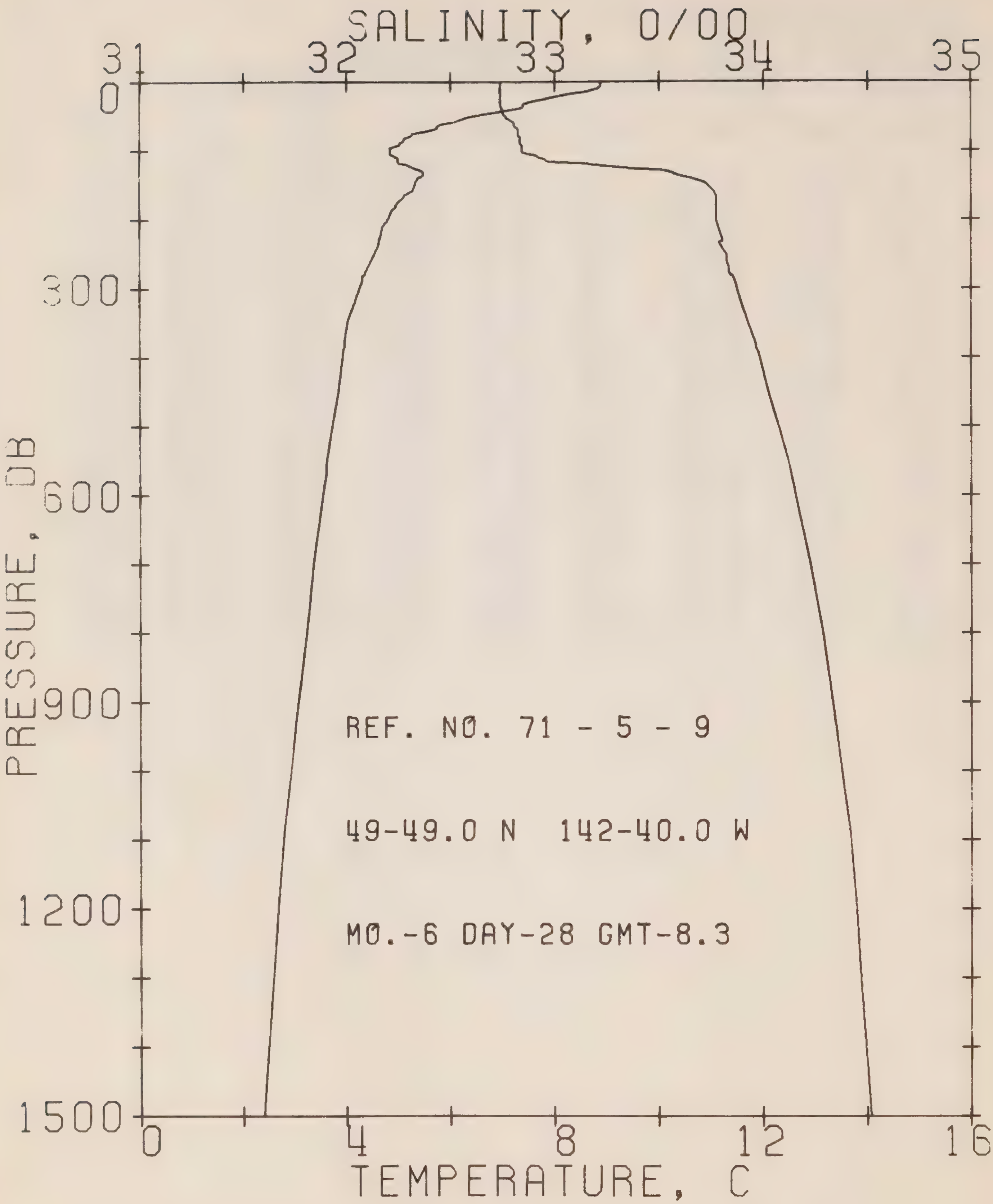
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 7 DATE 27/ 6/71
POSITION 49-34.0N, 138-40.0W GMT 18.8
RESULTS OF STP CAST 105 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.75	32.75	0	25.26	271.7	0.0	0.0	1487.
10	9.73	32.75	10	25.27	271.9	0.27	0.01	1487.
20	8.43	32.75	20	25.47	252.6	0.54	0.05	1482.
30	7.68	32.75	30	25.58	242.3	0.78	0.12	1479.
50	6.24	32.76	50	25.78	223.4	1.25	0.30	1474.
75	5.49	32.79	75	25.89	212.6	1.79	0.65	1471.
100	4.90	32.87	99	26.02	200.4	2.31	1.11	1469.
125	5.16	33.21	124	26.26	178.0	2.79	1.66	1471.
150	5.33	33.62	149	26.57	149.5	3.20	2.23	1473.
175	5.20	33.73	174	26.67	140.0	3.56	2.83	1473.
200	5.00	33.75	199	26.71	136.5	3.90	3.49	1473.
225	4.70	33.78	223	26.77	130.9	4.24	4.21	1472.
250	4.50	33.81	248	26.81	127.0	4.56	4.99	1471.
300	4.21	33.86	298	26.88	120.6	5.18	6.72	1471.
400	3.90	33.96	397	26.99	110.8	6.34	10.85	1472.
500	3.78	34.08	496	27.10	101.3	7.39	15.68	1473.
600	3.58	34.16	595	27.19	94.0	8.37	21.16	1474.
800	3.30	34.30	793	27.32	82.1	10.12	33.62	1476.
1000	3.00	34.38	990	27.42	74.2	11.68	47.87	1478.
1200	2.71	34.45	1188	27.50	67.0	13.09	63.64	1480.
1500	2.35	34.52	1484	27.58	59.3	14.98	89.66	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 8
49-41.0 N 140-40.0 W
MO.-6 DAY-28 GMT-1.0
0
4
8
12
16
TEMPERATURE, C

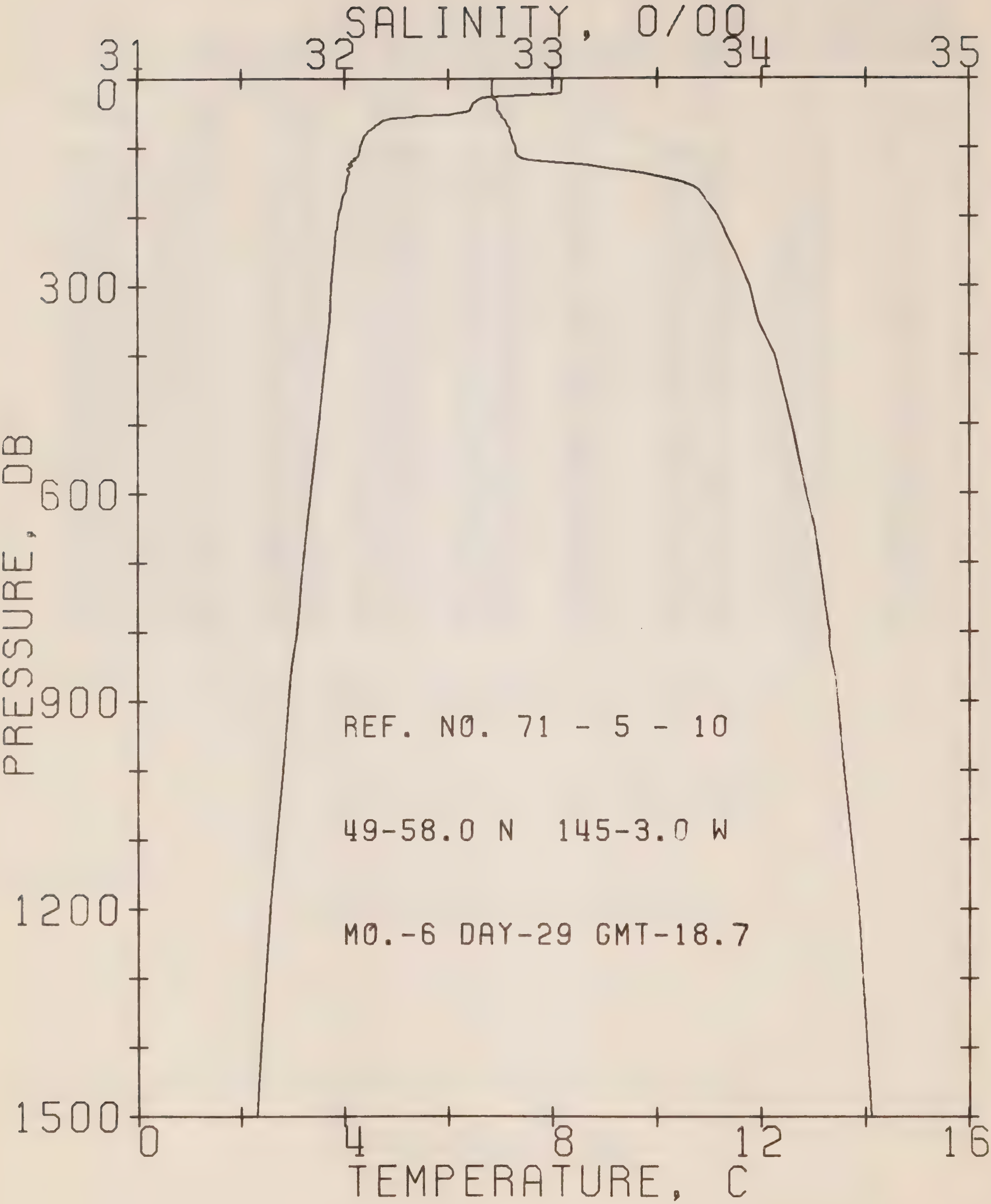
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 8 DATE 28/ 6/71
POSITION 49-41.0N, 140-40.0W GMT 1.0
RESULTS OF STP CAST 96 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.54	32.68	0	25.24	273.7	0.0	0.0	1486.
10	9.53	32.68	10	25.24	274.0	0.27	0.01	1486.
20	9.18	32.68	20	25.30	268.8	0.55	0.06	1485.
30	8.21	32.68	30	25.45	254.8	0.81	0.12	1481.
50	7.02	32.71	50	25.64	236.8	1.30	0.32	1477.
75	6.38	32.76	75	25.76	225.4	1.87	0.69	1475.
100	5.85	32.79	99	25.85	217.0	2.43	1.18	1473.
125	5.35	32.83	124	25.94	208.6	2.96	1.79	1472.
150	5.32	33.01	149	26.09	195.0	3.47	2.50	1472.
175	5.87	33.60	174	26.49	157.6	3.91	3.24	1476.
200	5.72	33.73	199	26.61	146.4	4.29	3.96	1476.
225	5.18	33.77	223	26.70	137.3	4.65	4.73	1474.
250	4.94	33.83	248	26.78	130.4	4.98	5.54	1473.
300	4.65	33.88	298	26.85	123.9	5.62	7.33	1473.
400	3.98	33.94	397	26.97	113.1	6.81	11.56	1472.
500	3.80	34.04	496	27.07	104.6	7.89	16.52	1473.
600	3.63	34.14	595	27.16	96.1	8.90	22.12	1474.
800	3.30	34.28	793	27.31	83.5	10.69	34.88	1476.
1000	2.98	34.37	990	27.41	74.7	12.28	49.38	1478.
1200	2.73	34.44	1188	27.49	67.9	13.70	65.30	1480.
1500	2.42	34.51	1484	27.57	60.9	15.63	91.82	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NØ. 71 - 5 - 9
49-49.0 N 142-40.0 W
MØ.-6 DAY-28 GMT-8.3
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 9 DATE 28/ 6/71
POSITION 49-49.0N, 142-40.0W GMT 8.3
RESULTS OF STP CAST 84 POINTS TAKEN FROM ANALOG TRACE

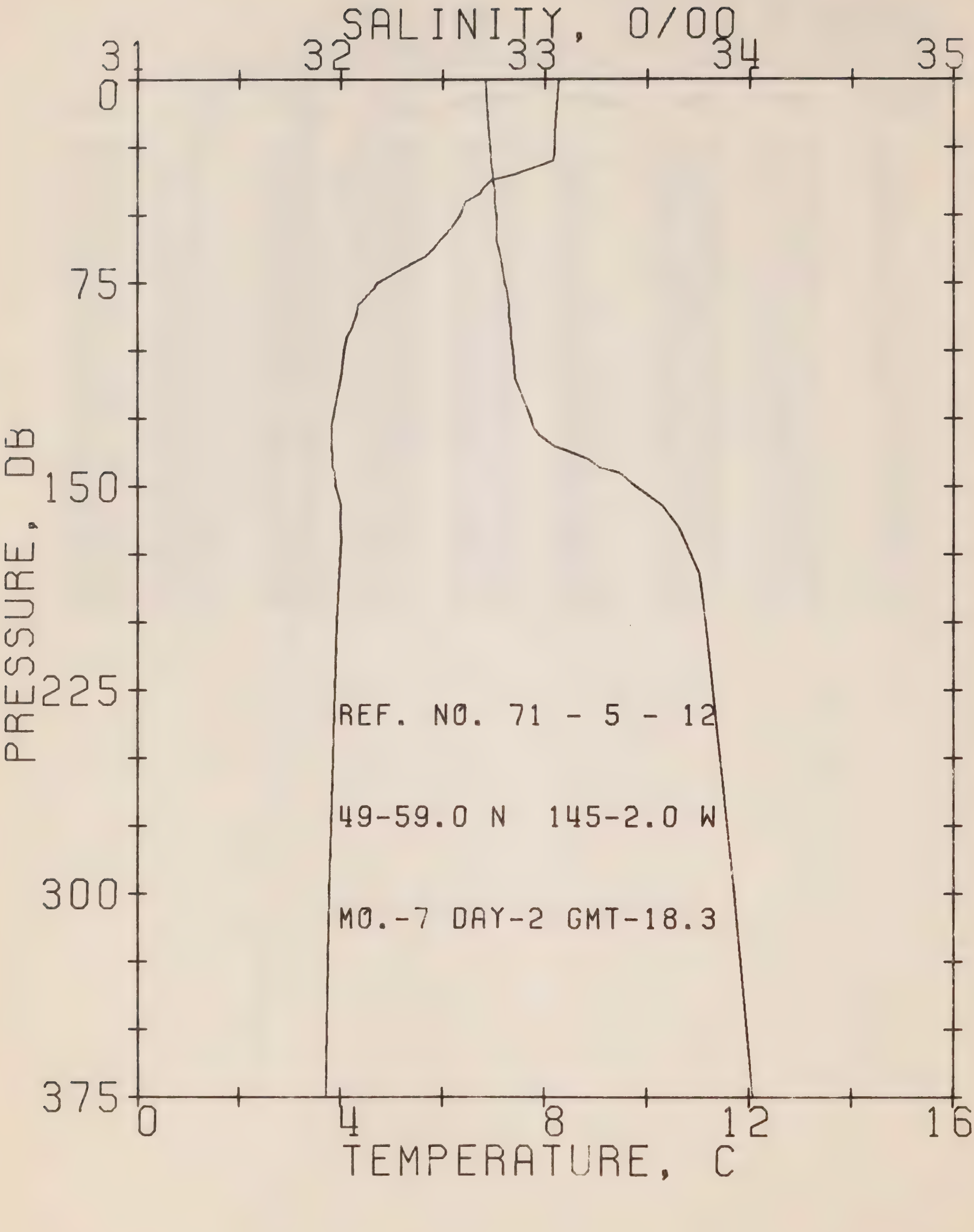
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.91	32.74	0	25.39	259.8	0.0	0.0	1483.
10	8.85	32.74	10	25.40	259.3	0.26	0.01	1483.
20	8.17	32.74	20	25.50	249.6	0.51	0.05	1481.
30	7.52	32.74	30	25.59	240.9	0.76	0.11	1479.
50	6.48	32.77	50	25.76	225.5	1.23	0.31	1475.
75	5.33	32.83	75	25.94	207.9	1.77	0.65	1471.
100	4.85	32.85	99	26.01	201.4	2.28	1.10	1469.
125	5.31	33.34	124	26.35	170.0	2.76	1.65	1472.
150	5.36	33.74	149	26.66	140.8	3.14	2.18	1473.
175	5.03	33.78	174	26.73	134.4	3.48	2.74	1472.
200	4.83	33.78	199	26.75	132.4	3.81	3.38	1472.
225	4.66	33.81	223	26.79	128.9	4.14	4.09	1472.
250	4.58	33.83	248	26.82	126.4	4.46	4.87	1472.
300	4.28	33.88	298	26.89	119.9	5.08	6.60	1471.
400	3.95	33.99	397	27.01	109.0	6.22	10.66	1472.
500	3.74	34.08	496	27.11	100.9	7.27	15.48	1473.
600	3.56	34.16	595	27.19	93.8	8.25	20.92	1474.
800	3.24	34.29	793	27.32	82.1	10.00	33.37	1476.
1000	2.93	34.38	990	27.42	73.4	11.55	47.57	1478.
1200	2.67	34.45	1188	27.50	66.5	12.94	63.12	1480.
1500	2.37	34.52	1484	27.58	59.6	14.84	89.14	1484.



SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NØ. 71 - 5 - 10
49-58.0 N 145-3.0 W
MØ.-6 DAY-29 GMT-18.7
0
4
8
12
16
TEMPERATURE, C

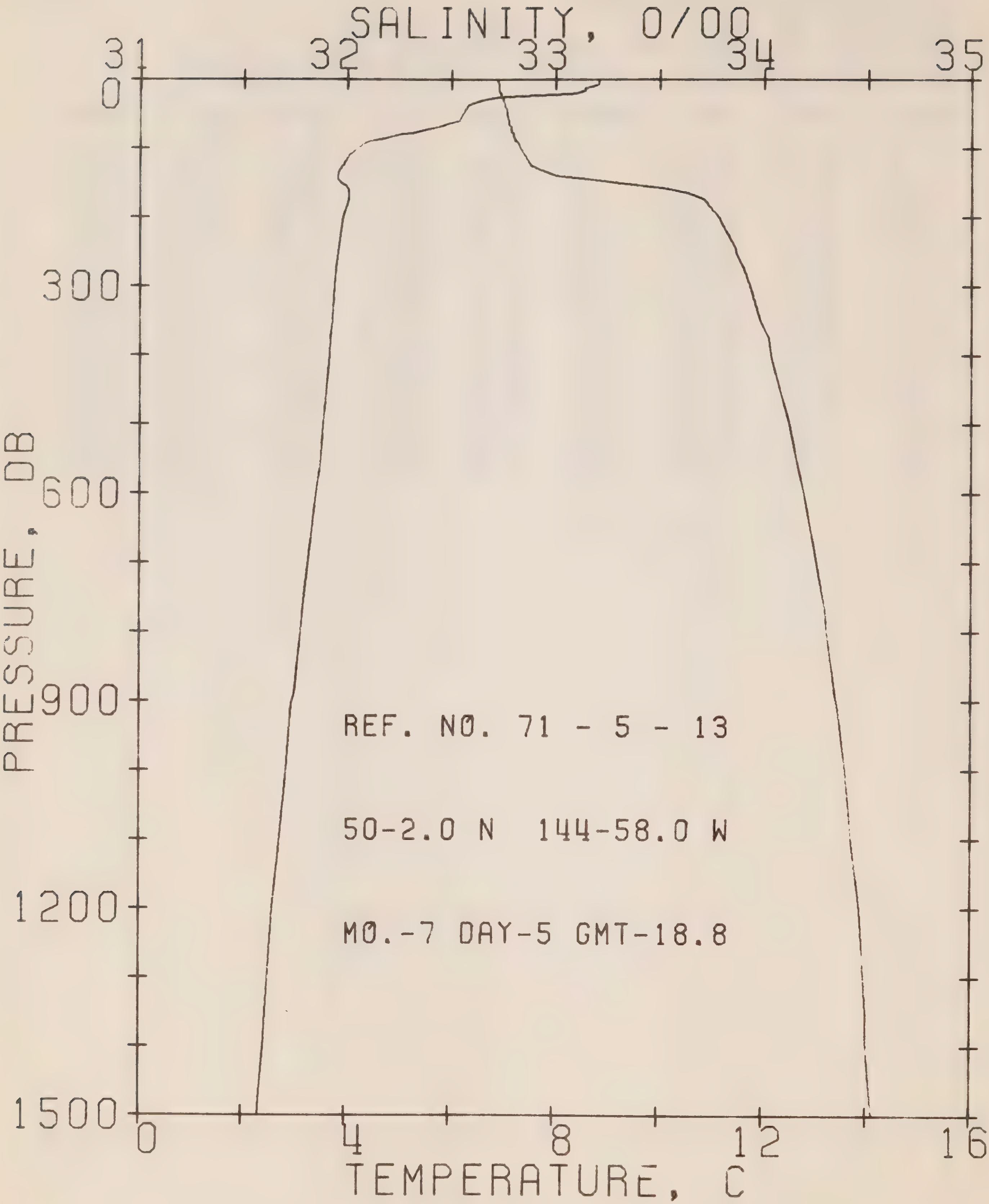
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 10 DATE 29/ 6/71
POSITION 49-58.0N, 145- 3.0W GMT 18.7
RESULTS OF STP CAST 66 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.20	32.71	0	25.47	251.8	0.0	0.0	1481.
10	8.20	32.71	10	25.47	252.2	0.25	0.01	1481.
20	8.20	32.71	20	25.47	252.3	0.50	0.05	1481.
30	6.61	32.73	30	25.71	229.9	0.74	0.11	1475.
50	6.15	32.75	50	25.78	223.0	1.20	0.30	1474.
75	4.51	32.80	75	26.01	201.4	1.72	0.63	1467.
100	4.34	32.83	99	26.05	197.6	2.21	1.07	1467.
125	4.19	33.17	124	26.34	170.7	2.69	1.62	1467.
150	4.08	33.63	149	26.71	135.3	3.07	2.15	1468.
175	3.99	33.74	174	26.81	126.4	3.40	2.68	1468.
200	3.91	33.80	199	26.87	121.2	3.71	3.27	1468.
225	3.85	33.84	223	26.90	118.0	4.00	3.92	1468.
250	3.83	33.88	248	26.94	114.8	4.30	4.62	1469.
300	3.76	33.95	298	27.00	109.2	4.86	6.19	1469.
400	3.65	34.07	397	27.11	99.9	5.91	9.94	1471.
500	3.52	34.15	496	27.18	93.4	6.88	14.36	1472.
600	3.36	34.22	595	27.25	87.2	7.78	19.40	1473.
800	3.09	34.33	793	27.37	77.5	9.42	31.05	1475.
1000	2.82	34.40	990	27.45	70.7	10.89	44.54	1477.
1200	2.56	34.47	1188	27.53	63.9	12.24	59.57	1480.
1500	2.28	34.53	1483	27.60	57.8	14.06	84.55	1484.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 5 - 12
49-59.0 N 145-2.0 W
MO.-7 DAY-2 GMT-18.3
0
4
8
12
16
TEMPERATURE, C

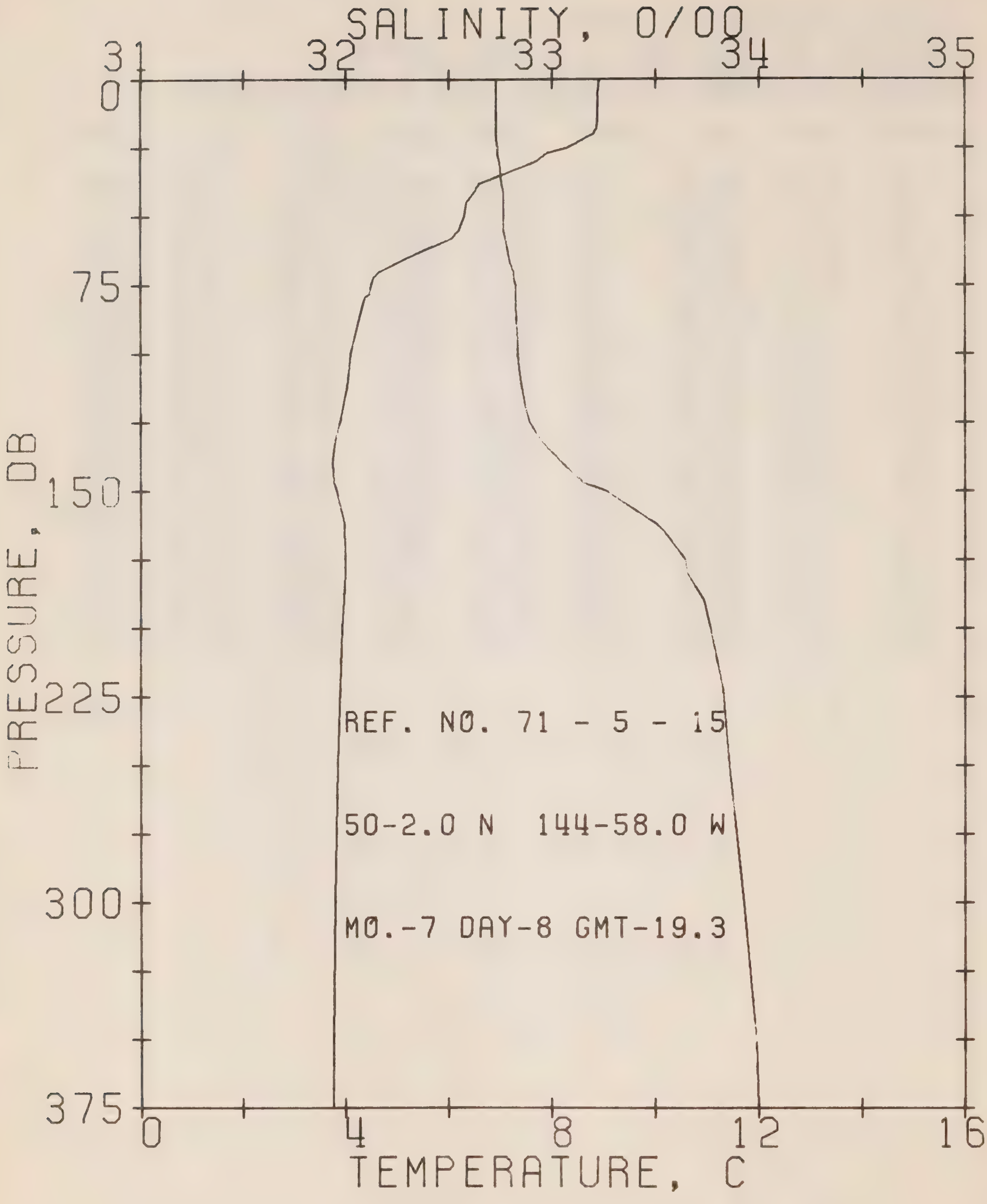
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 12 DATE 2/ 7/71
POSITION 49-59.0N, 145- 2.0W GMT 18.3
RESULTS OF STP CAST 42 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.29	32.71	0	25.46	253.1	0.0	0.0	1481.
10	8.25	32.72	10	25.47	252.1	0.25	0.01	1481.
20	8.21	32.73	20	25.49	251.0	0.50	0.05	1481.
30	8.18	32.74	30	25.50	249.9	0.75	0.12	1481.
50	6.38	32.77	50	25.77	224.3	1.22	0.30	1474.
75	4.75	32.81	75	25.99	203.1	1.76	0.65	1468.
100	4.09	32.85	99	26.09	193.6	2.25	1.09	1466.
125	3.85	32.94	124	26.19	184.7	2.73	1.63	1465.
150	3.89	33.45	149	26.59	146.9	3.15	2.22	1467.
175	4.01	33.72	174	26.79	128.1	3.49	2.78	1468.
200	3.94	33.79	199	26.86	122.3	3.80	3.37	1468.
225	3.89	33.82	223	26.89	119.4	4.10	4.03	1469.
250	3.85	33.86	248	26.92	116.5	4.40	4.74	1469.
300	3.78	33.93	298	26.98	110.9	4.97	6.33	1469.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 13
50-2.0 N 144-58.0 W
MO.-7 DAY-5 GMT-18.8
0
4
8
12
16
TEMPERATURE, C

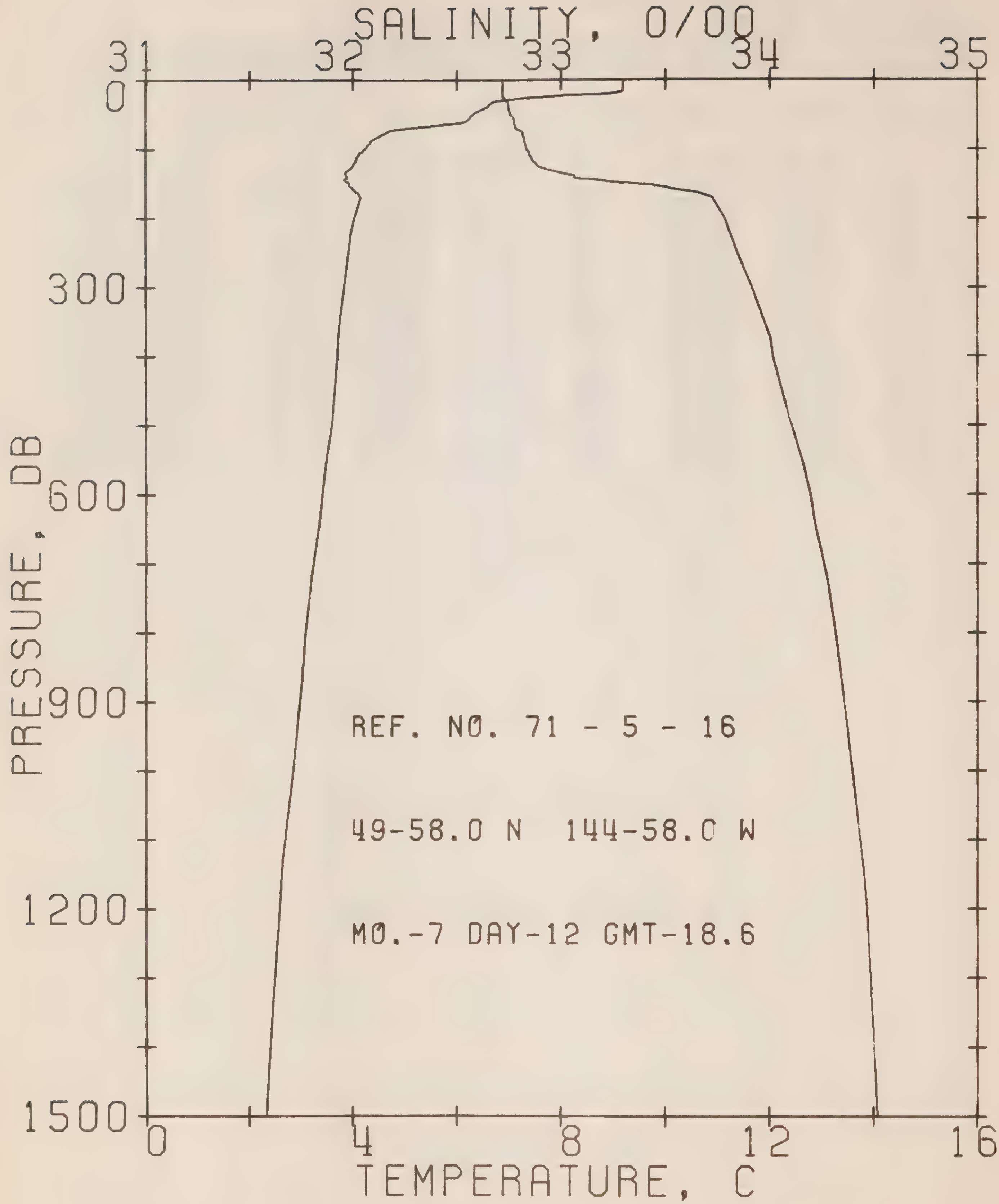
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 13 DATE 5/ 7/71
POSITION 50- 2.0N, 144-58.0W GMT 18.8
RESULTS OF STP CAST 61 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.85	32.72	0	25.38	260.3	0.0	0.0	1483.
10	8.73	32.73	10	25.41	258.2	0.26	0.01	1483.
20	8.42	32.74	20	25.46	253.1	0.52	0.05	1482.
30	6.63	32.75	30	25.72	228.6	0.75	0.11	1475.
50	6.25	32.77	50	25.79	222.8	1.20	0.30	1474.
75	5.43	32.79	75	25.90	212.0	1.75	0.64	1471.
100	4.21	32.84	99	26.07	195.6	2.26	1.09	1466.
125	3.94	32.89	124	26.14	189.3	2.74	1.64	1466.
150	3.88	33.29	149	26.46	158.9	3.18	2.27	1466.
175	4.05	33.72	174	26.79	128.5	3.53	2.84	1468.
200	3.95	33.79	199	26.85	122.4	3.84	3.44	1468.
225	3.89	33.83	223	26.89	118.7	4.15	4.09	1469.
250	3.84	33.87	248	26.93	115.6	4.44	4.80	1469.
300	3.78	33.94	298	26.99	110.2	5.00	6.38	1469.
400	3.68	34.04	397	27.08	102.5	6.06	10.15	1471.
500	3.56	34.13	496	27.16	95.3	7.05	14.67	1472.
600	3.43	34.20	595	27.23	89.4	7.98	19.85	1473.
800	3.14	34.31	793	27.35	79.6	9.66	31.77	1475.
1000	2.85	34.40	990	27.44	71.1	11.16	45.53	1478.
1200	2.59	34.47	1188	27.52	64.1	12.52	60.73	1480.
1500	2.30	34.53	1484	27.60	58.0	14.36	85.99	1484.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 5 - 15
50-2.0 N 144-58.0 W
MO.-7 DAY-8 GMT-19.3
0
4
8
12
16
TEMPERATURE, C

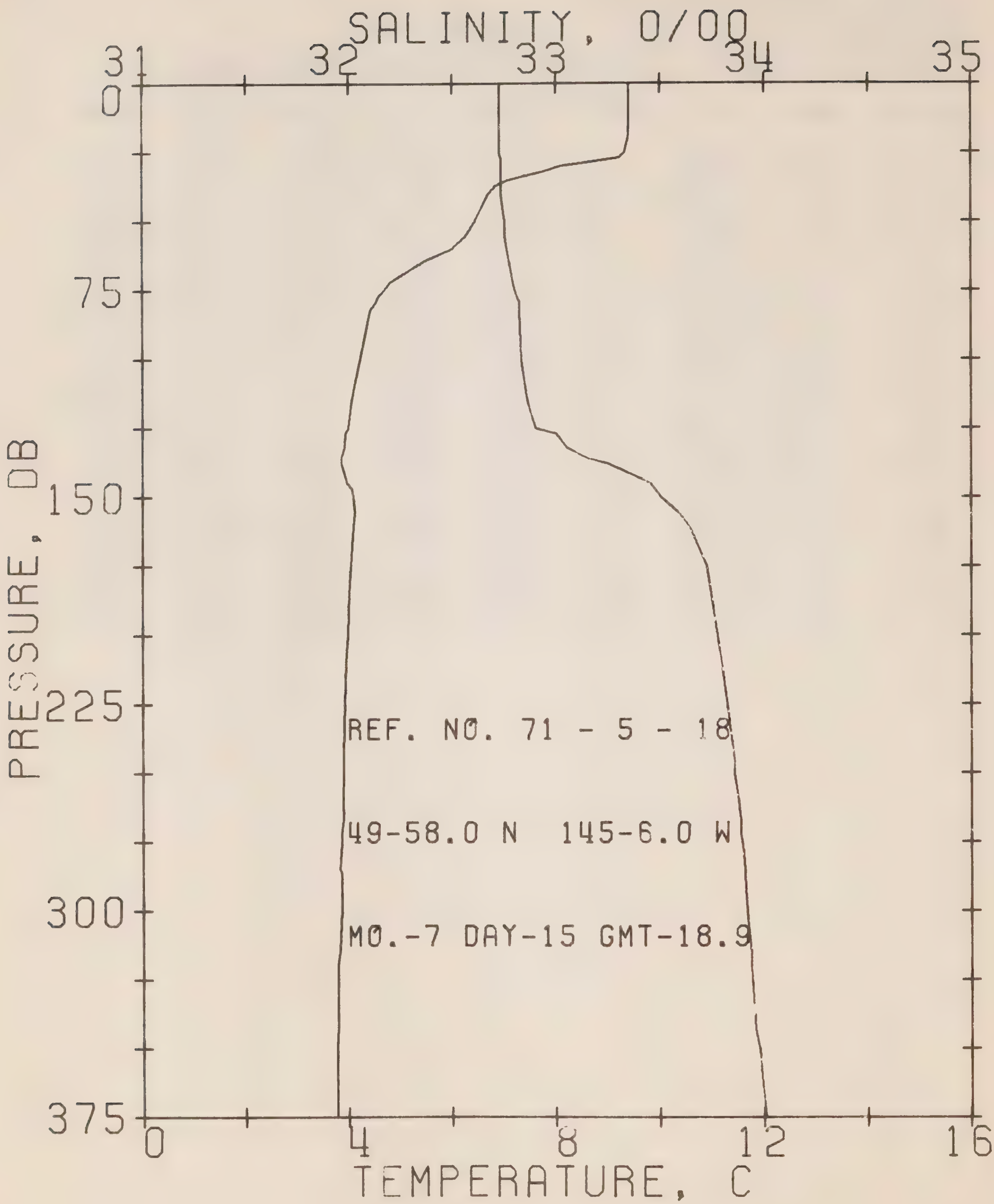
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 15 DATE 8/ 7/71
POSITION 50- 2.0N, 144-58.0W GMT 19.3
RESULTS OF STP CAST 44 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.93	32.73	0	25.38	260.8	0.0	0.0	1484.
10	8.91	32.73	10	25.38	260.9	0.26	0.01	1484.
20	8.83	32.73	20	25.39	259.9	0.52	0.05	1483.
30	7.72	32.75	30	25.57	242.8	0.77	0.12	1479.
50	6.33	32.77	50	25.78	223.7	1.23	0.30	1474.
75	4.52	32.83	75	26.03	199.2	1.76	0.64	1467.
100	4.12	32.84	99	26.08	194.6	2.25	1.08	1466.
125	3.91	32.90	124	26.15	188.2	2.73	1.63	1466.
150	3.82	33.27	149	26.45	159.8	3.18	2.25	1466.
175	4.00	33.65	174	26.74	133.2	3.54	2.84	1468.
200	3.94	33.77	199	26.84	123.7	3.86	3.45	1468.
225	3.88	33.83	223	26.90	118.7	4.16	4.11	1468.
250	3.84	33.86	248	26.92	116.4	4.45	4.82	1469.
300	3.79	33.93	298	26.98	111.0	5.02	6.41	1469.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 16
49-58.0 N 144-58.0 W
MO.-7 DAY-12 GMT-18.6
0
4
8
12
16
TEMPERATURE, C

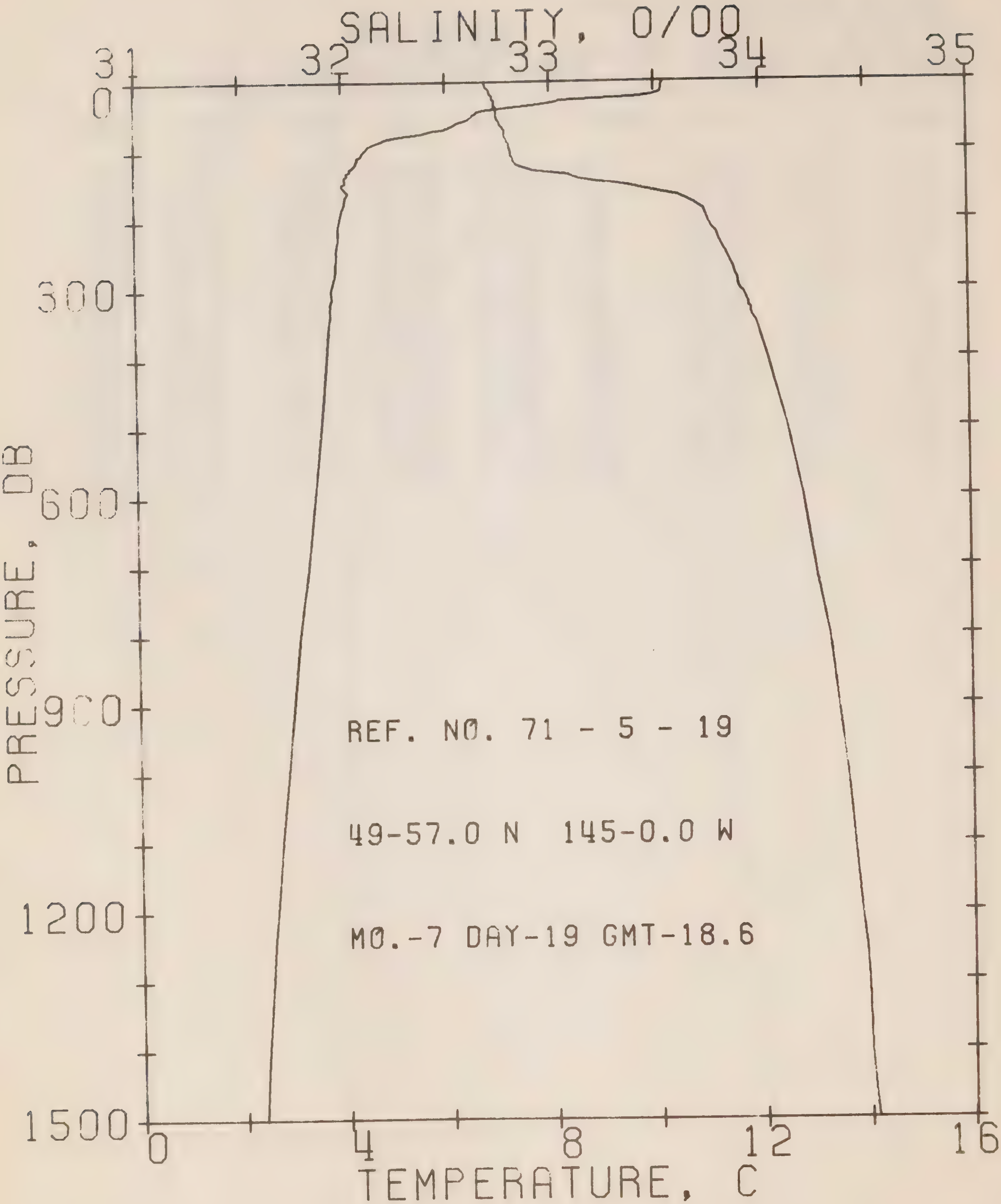
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 16 DATE 12/ 7/71
POSITION 49-58.0N, 144-58.0W GMT 18.6
RESULTS OF STP CAST 62 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.23	32.72	0	25.32	266.0	0.0	0.0	1485.
10	9.21	32.72	10	25.33	266.2	0.27	0.01	1485.
20	8.91	32.72	20	25.37	261.8	0.53	0.05	1484.
30	6.83	32.74	30	25.69	231.9	0.78	0.12	1476.
50	6.34	32.76	50	25.77	224.6	1.23	0.30	1474.
75	4.69	32.82	75	26.01	201.7	1.77	0.64	1468.
100	4.25	32.84	99	26.07	195.9	2.27	1.09	1467.
125	4.01	32.90	124	26.14	189.3	2.75	1.64	1466.
150	3.93	33.36	149	26.51	154.1	3.19	2.25	1467.
175	4.16	33.74	174	26.79	128.1	3.53	2.82	1469.
200	4.05	33.79	199	26.84	123.4	3.84	3.42	1469.
225	3.98	33.82	223	26.88	120.6	4.15	4.08	1469.
250	3.93	33.85	248	26.90	118.1	4.45	4.80	1469.
300	3.85	33.92	298	26.97	112.4	5.02	6.41	1470.
400	3.72	34.02	397	27.06	104.4	6.10	10.24	1471.
500	3.61	34.11	496	27.14	97.2	7.11	14.86	1472.
600	3.43	34.20	595	27.23	89.4	8.04	20.07	1473.
800	3.10	34.32	793	27.36	78.4	9.72	31.97	1475.
1000	2.86	34.40	990	27.44	71.2	11.21	45.65	1478.
1200	2.58	34.47	1188	27.52	64.0	12.56	60.70	1480.
1500	2.31	34.52	1484	27.59	58.9	14.40	86.02	1484.


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 5 - 18
49-58.0 N 145-6.0 W
MO.-7 DAY-15 GMT-18.9
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 18 DATE 15/ 7/71
POSITION 49-58.0N, 145- 6.0W GMT 18.9
RESULTS OF STP CAST 51 POINTS TAKEN FROM ANALOG TRACE

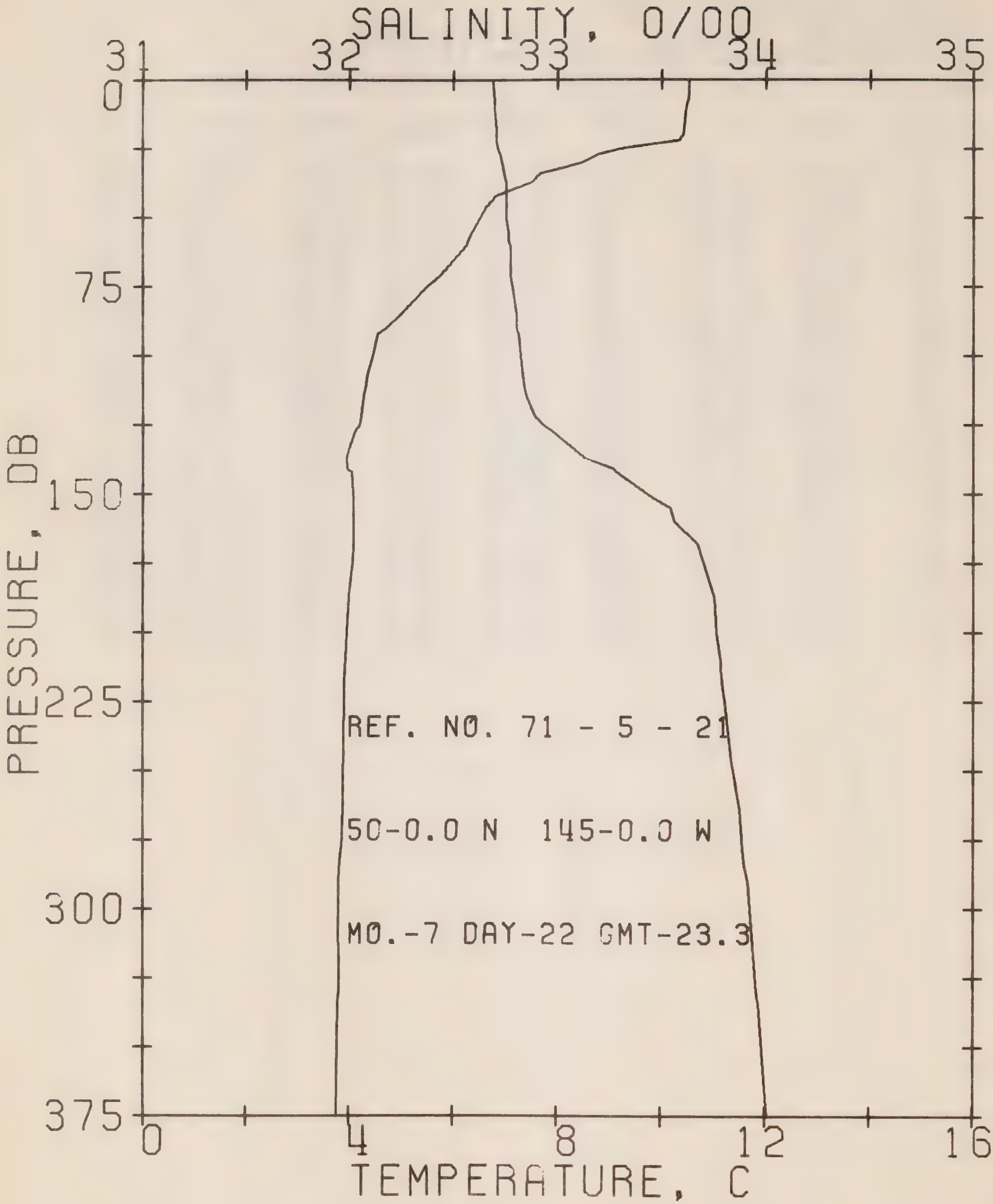
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	9.43	32.73	0	25.30	268.3	0.0	0.0	1485.
10	9.43	32.73	10	25.30	268.7	0.27	0.01	1486.
20	9.43	32.73	20	25.30	268.9	0.54	0.05	1486.
30	8.13	32.74	30	25.51	249.2	0.80	0.12	1481.
50	6.48	32.76	50	25.75	226.3	1.27	0.31	1475.
75	4.72	32.81	75	26.00	202.8	1.81	0.65	1468.
100	4.25	32.84	99	26.07	195.9	2.30	1.09	1467.
125	4.01	32.91	124	26.15	188.5	2.78	1.65	1466.
150	4.10	33.51	149	26.62	144.5	3.19	2.22	1468.
175	4.05	33.73	174	26.80	127.6	3.53	2.77	1468.
200	3.99	33.78	199	26.84	123.5	3.84	3.37	1468.
225	3.92	33.83	223	26.89	119.6	4.15	4.03	1469.
250	3.90	33.86	248	26.92	117.0	4.44	4.74	1469.
300	3.85	33.92	298	26.97	112.4	5.01	6.34	1470.



SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 19
49-57.0 N 145-0.0 W
MO.-7 DAY-19 GMT-18.6
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 19 DATE 19/ 7/71
POSITION 49-57.0N, 145- 0.0W GMT 18.6
RESULTS OF STP CAST 78 POINTS TAKEN FROM ANALOG TRACE

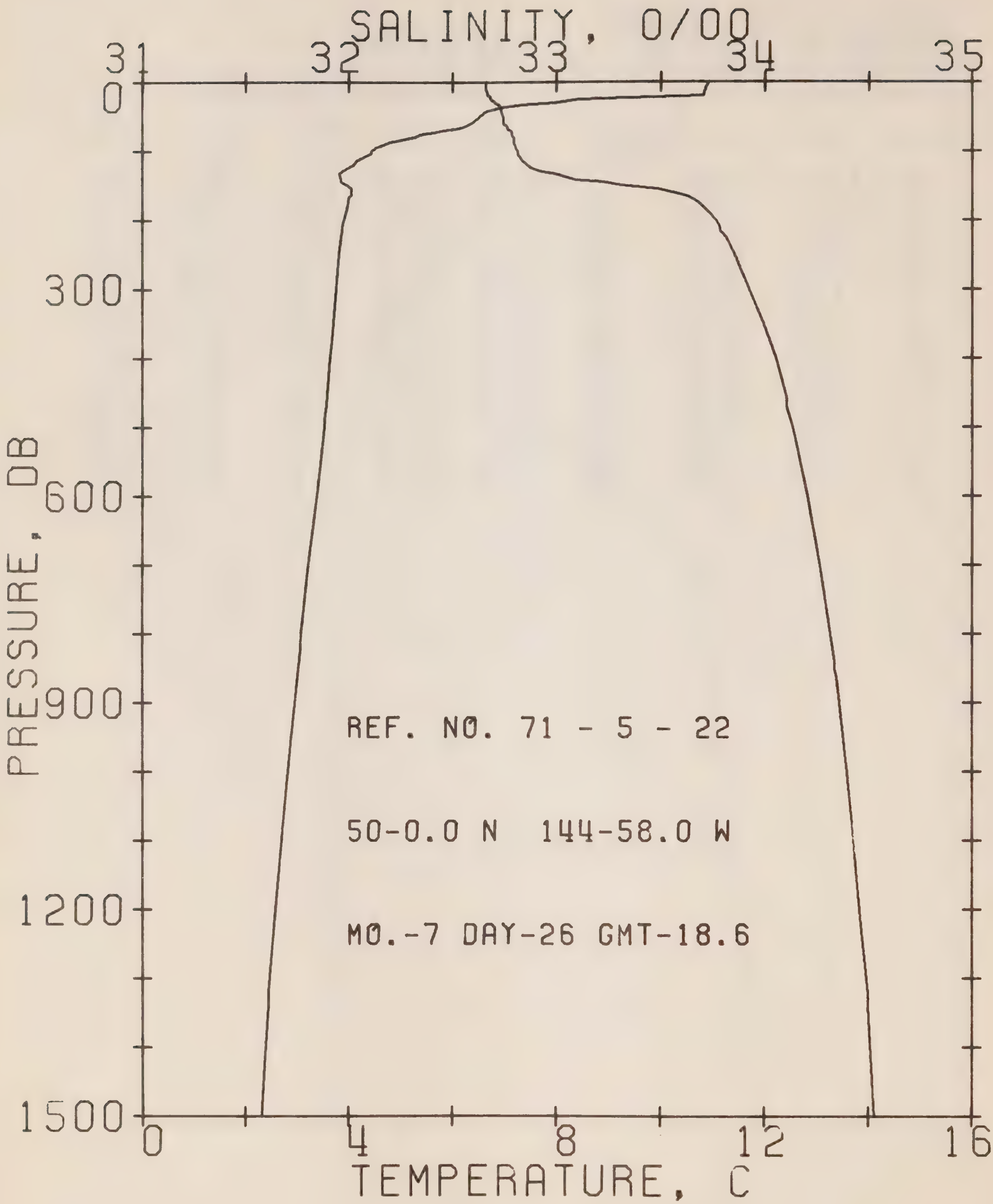
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.21	32.69	0	25.14	283.5	0.0	0.0	1488.
10	10.17	32.71	10	25.16	281.8	0.28	0.01	1488.
20	9.98	32.73	20	25.21	277.4	0.56	0.06	1488.
30	8.08	32.74	30	25.51	248.6	0.82	0.12	1481.
50	6.55	32.75	50	25.73	227.9	1.29	0.31	1475.
75	5.54	32.79	75	25.89	213.2	1.85	0.67	1472.
100	4.45	32.82	99	26.03	199.4	2.36	1.12	1467.
125	4.18	32.90	124	26.12	190.9	2.85	1.68	1467.
150	4.02	33.38	149	26.52	153.4	3.28	2.29	1467.
175	4.08	33.69	174	26.76	131.0	3.64	2.87	1468.
200	3.98	33.76	199	26.83	124.9	3.95	3.48	1468.
225	3.95	33.81	223	26.87	121.3	4.26	4.14	1469.
250	3.91	33.85	248	26.91	117.8	4.56	4.87	1469.
300	3.79	33.91	298	26.97	112.6	5.14	6.48	1469.
400	3.70	34.04	397	27.08	102.7	6.21	10.29	1471.
500	3.57	34.13	496	27.16	95.4	7.20	14.81	1472.
600	3.44	34.20	595	27.23	89.5	8.12	19.98	1473.
800	3.11	34.32	793	27.36	78.5	9.81	31.96	1475.
1000	2.85	34.40	990	27.44	71.1	11.30	45.60	1478.
1200	2.61	34.46	1188	27.51	65.1	12.66	60.83	1480.
1500	2.33	34.53	1484	27.59	58.4	14.51	86.21	1484.



SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 5 - 21
50-0.0 N 145-0.0 W
MO.-7 DAY-22 GMT-23.3
0
4
8
12
16
TEMPERATURE, C

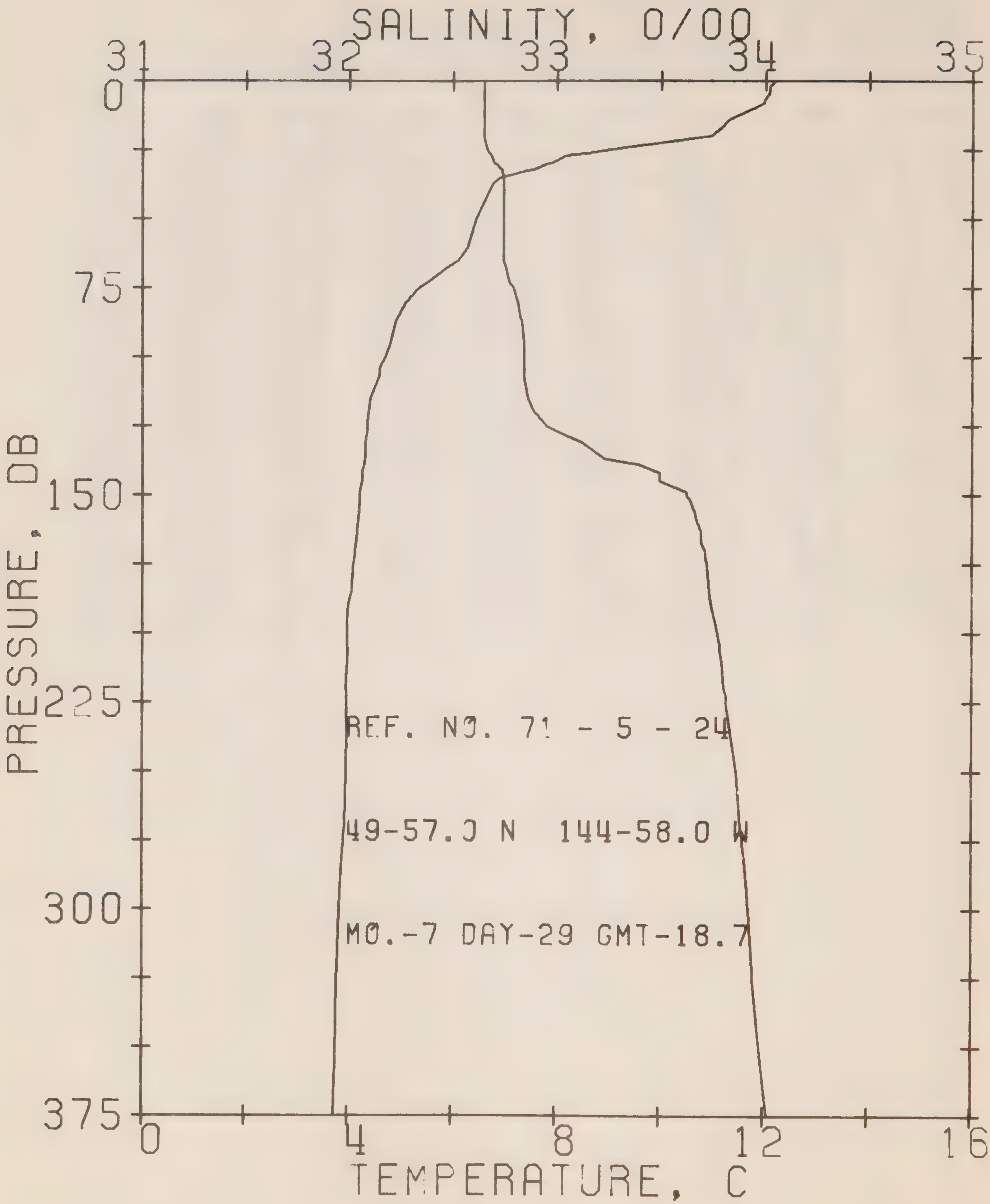
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 21 DATE 22/ 7/71
POSITION 50- 0.0N, 145- 0.0W GMT 23.3
RESULTS OF STP CAST 58 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.55	32.69	0	25.08	289.0	0.0	0.0	1489.
10	10.49	32.70	10	25.10	287.7	0.29	0.01	1489.
20	10.44	32.71	20	25.12	286.3	0.58	0.06	1489.
30	8.51	32.74	30	25.45	254.7	0.85	0.13	1482.
50	6.54	32.76	50	25.74	227.1	1.32	0.32	1475.
75	5.52	32.79	75	25.89	213.0	1.87	0.67	1471.
100	4.48	32.83	99	26.04	199.0	2.38	1.13	1468.
125	4.23	32.94	124	26.15	188.4	2.87	1.68	1467.
150	4.08	33.44	149	26.56	149.6	3.29	2.27	1468.
175	4.08	33.71	174	26.78	129.5	3.63	2.84	1468.
200	3.96	33.77	199	26.84	123.9	3.95	3.44	1468.
225	3.91	33.81	223	26.87	120.7	4.25	4.10	1469.
250	3.88	33.85	248	26.91	117.5	4.55	4.82	1469.
300	3.79	33.93	298	26.98	111.0	5.12	6.42	1469.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 22
50-0.0 N 144-58.0 W
MO.-7 DAY-26 GMT-18.6
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 22 DATE 26/ 7/71
POSITION 50- 0.0N, 144-58.0W GMT 18.6
RESULTS OF STP CAST 65 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	10.96	32.66	0	24.99	298.1	0.0	0.0	1491.
10	10.89	32.66	10	25.00	297.3	0.30	0.02	1491.
20	10.83	32.68	20	25.02	295.0	0.59	0.06	1491.
30	7.99	32.71	30	25.50	249.5	0.86	0.13	1480.
50	6.55	32.75	50	25.73	227.9	1.33	0.32	1475.
75	5.48	32.79	75	25.90	212.5	1.88	0.67	1471.
100	4.47	32.82	99	26.03	199.7	2.40	1.13	1468.
125	3.99	32.89	124	26.14	189.8	2.89	1.69	1466.
150	3.99	33.32	149	26.48	157.6	3.32	2.30	1467.
175	4.01	33.69	174	26.77	130.2	3.67	2.88	1468.
200	3.94	33.77	199	26.84	123.7	3.99	3.48	1468.
225	3.87	33.82	223	26.89	119.5	4.29	4.14	1468.
250	3.83	33.86	248	26.92	116.3	4.59	4.86	1469.
300	3.78	33.93	298	26.98	110.9	5.16	6.44	1469.
400	3.65	34.06	397	27.10	100.6	6.21	10.20	1471.
500	3.55	34.14	496	27.17	94.4	7.19	14.67	1472.
600	3.40	34.21	595	27.24	88.4	8.10	19.78	1473.
800	3.08	34.32	793	27.36	78.1	9.76	31.58	1475.
1000	2.83	34.40	990	27.45	70.8	11.25	45.19	1477.
1200	2.58	34.46	1188	27.52	64.8	12.61	60.35	1480.
1500	2.29	34.53	1484	27.60	58.0	14.44	85.44	1484.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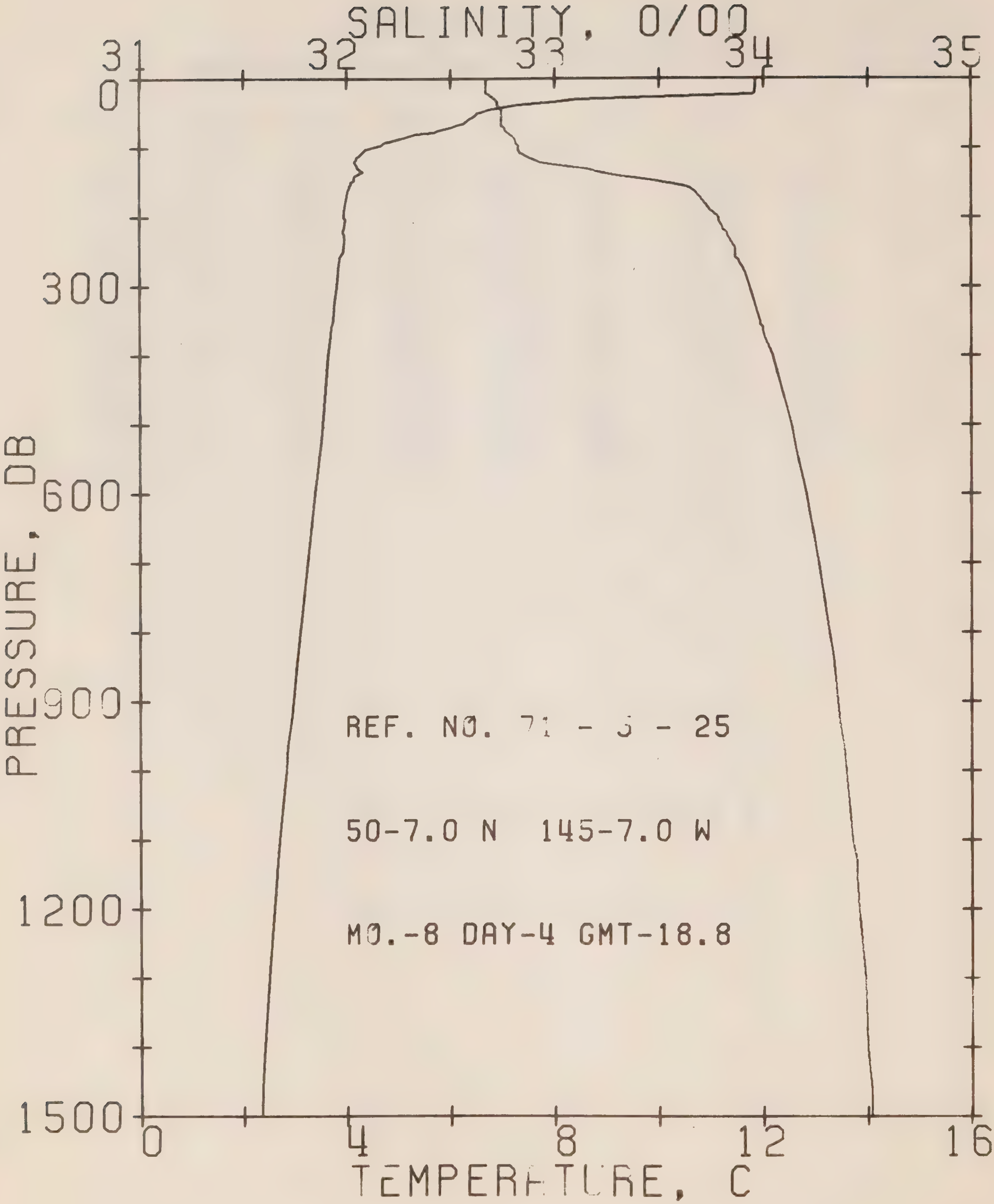
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 5 - 24
49-57.0 N 144-58.0 W
MO.-7 DAY-29 GMT-18.7
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 24 DATE 29/ 7/71
POSITION 49-57.0N, 144-58.0W GMT 18.7
RESULTS OF STP CAST 75 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	12.21	32.65	0	24.75	320.5	0.0	0.0	1495.
10	11.78	32.65	10	24.83	313.3	0.32	0.02	1494.
20	10.98	32.65	20	24.97	299.8	0.62	0.06	1491.
30	7.84	32.71	30	25.52	247.5	0.89	0.13	1480.
50	6.48	32.75	50	25.74	227.1	1.36	0.32	1475.
75	5.37	32.80	75	25.92	210.5	1.91	0.67	1471.
100	4.73	32.85	99	26.03	200.1	2.42	1.13	1469.
125	4.38	32.96	124	26.15	188.4	2.91	1.69	1468.
150	4.23	33.63	149	26.70	136.8	3.32	2.25	1468.
175	4.11	33.73	174	26.79	128.3	3.64	2.80	1468.
200	3.98	33.78	199	26.84	123.4	3.96	3.40	1468.
225	3.96	33.82	223	26.88	120.4	4.27	4.06	1469.
250	3.96	33.87	248	26.92	116.9	4.56	4.78	1469.
300	3.83	33.93	298	26.98	111.4	5.13	6.38	1470.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32
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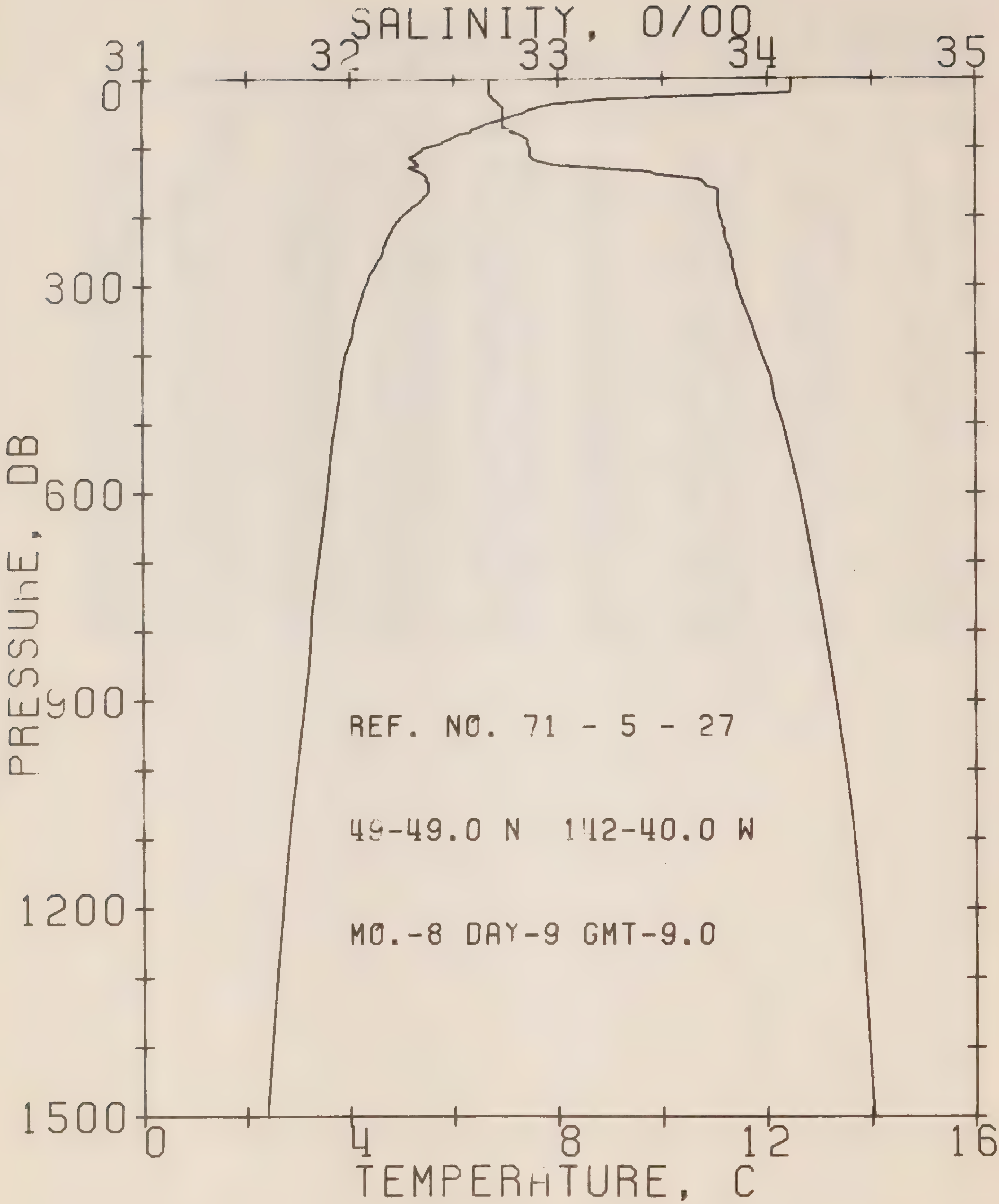
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 3 - 25
50-7.0 N 145-7.0 W
MO.-8 DAY-4 GMT-18.8
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 25 DATE 4/ 8/71
POSITION 50- 7.0N, 145- 7.0W GMT 18.8
RESULTS OF STP CAST 81 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	11.86	32.67	0	24.83	312.8	0.0	0.0	1494.
10	11.86	32.67	10	24.83	313.2	0.31	0.02	1494.
20	11.85	32.67	20	24.83	313.2	0.63	0.06	1494.
30	8.47	32.72	30	25.44	255.6	0.92	0.14	1482.
50	6.55	32.75	50	25.73	227.9	1.40	0.33	1475.
75	5.80	32.77	75	25.84	217.7	1.96	0.69	1473.
100	4.51	32.83	99	26.04	199.3	2.47	1.15	1468.
125	4.18	33.03	124	26.23	181.2	2.96	1.70	1467.
150	4.11	33.53	149	26.63	143.1	3.36	2.27	1468.
175	4.01	33.71	174	26.78	128.8	3.69	2.82	1468.
200	3.96	33.79	199	26.85	122.5	4.01	3.42	1468.
225	3.96	33.83	223	26.89	119.6	4.31	4.08	1469.
250	3.96	33.87	248	26.92	116.9	4.61	4.79	1469.
300	3.83	33.94	298	26.99	110.7	5.18	6.38	1470.
400	3.66	34.05	397	27.09	101.6	6.24	10.17	1471.
500	3.55	34.14	496	27.17	94.4	7.22	14.64	1472.
600	3.40	34.21	595	27.24	88.4	8.13	19.77	1473.
800	3.11	34.32	793	27.36	78.5	9.80	31.59	1475.
1000	2.83	34.40	990	27.45	70.8	11.29	45.22	1477.
1200	2.58	34.46	1188	27.52	64.8	12.64	60.35	1480.
1500	2.32	34.52	1483	27.59	59.0	14.48	85.66	1484.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32
33
34
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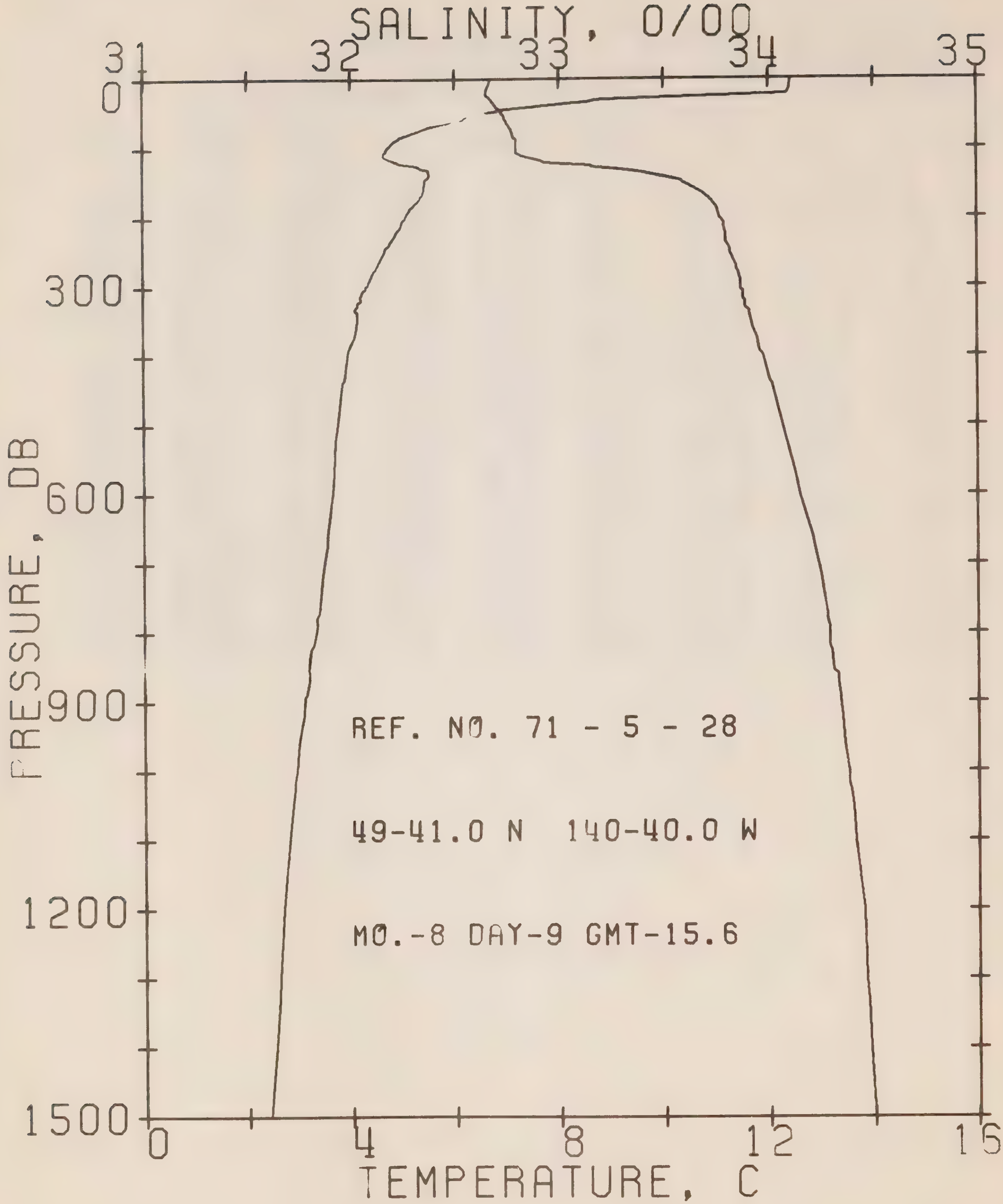
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 27
49-49.0 N 142-40.0 W
MO.-8 DAY-9 GMT-9.0
0
4
8
12
16
TEMPERATURE, C

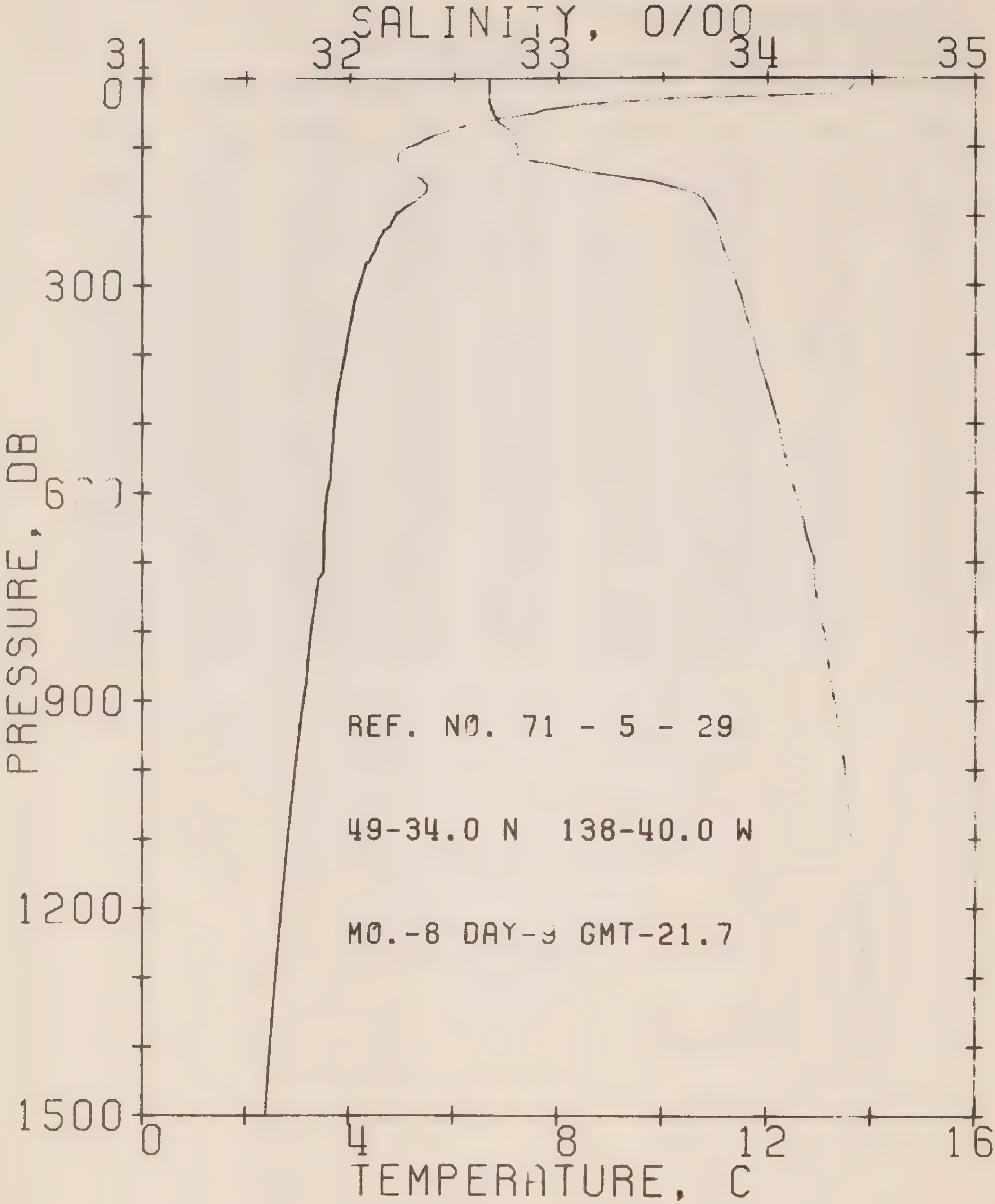
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 27 DATE 9/ 8/71
POSITION 49-49.0N, 142-40.0W GMT 9.0
RESULTS OF STP CAST 87 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	12.48	32.67	0	24.71	323.9	0.0	0.0	1496.
10	12.48	32.67	10	24.71	324.4	0.32	0.02	1496.
20	12.47	32.67	20	24.72	324.4	0.65	0.07	1496.
30	8.74	32.70	30	25.38	260.9	0.94	0.14	1483.
50	7.35	32.74	50	25.62	238.9	1.44	0.34	1478.
75	6.35	32.77	75	25.77	224.3	2.00	0.69	1475.
100	5.43	32.87	99	25.96	206.3	2.53	1.17	1472.
125	5.35	32.99	124	26.07	196.6	3.04	1.75	1472.
150	5.52	33.70	149	26.61	145.7	3.45	2.32	1474.
175	5.42	33.77	174	26.68	139.6	3.80	2.91	1474.
200	5.01	33.78	199	26.73	134.5	4.15	3.57	1473.
225	4.80	33.80	223	26.77	130.7	4.48	4.28	1472.
250	4.67	33.83	248	26.81	127.4	4.80	5.06	1472.
300	4.34	33.86	298	26.87	122.1	5.42	6.81	1472.
400	3.93	33.98	397	27.01	109.5	6.58	10.93	1472.
500	3.73	34.08	496	27.11	100.8	7.63	15.74	1473.
600	3.57	34.16	595	27.19	93.9	8.60	21.18	1474.
800	3.25	34.28	793	27.31	82.9	10.37	33.68	1476.
1000	2.97	34.38	990	27.42	73.8	11.94	48.02	1478.
1200	2.69	34.45	1188	27.50	66.7	13.34	63.68	1480.
1500	2.36	34.51	1484	27.57	60.2	15.24	89.77	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NØ. 71 - 5 - 28
49-41.0 N 140-40.0 W
MØ.-8 DAY-9 GMT-15.6
0
4
8
12
15
TEMPERATURE, C

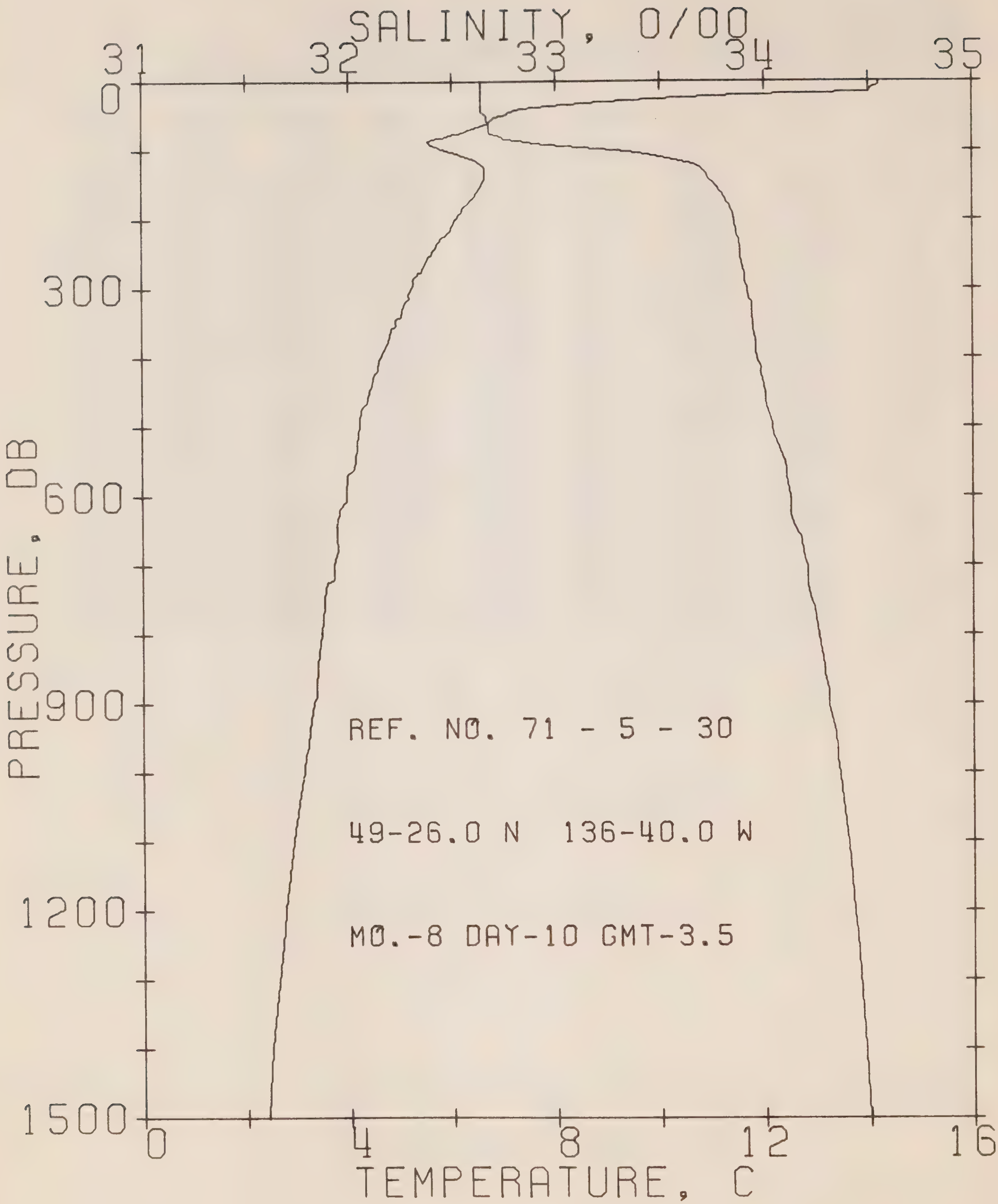
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 28 DATE 9/ 8/71
POSITION 49-41.0N, 140-40.0W GMT 15.6
RESULTS OF STP CAST 107 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	12.45	32.67	0	24.72	323.4	0.0	0.0	1496.
10	12.43	32.66	10	24.72	324.2	0.32	0.02	1496.
20	12.40	32.65	20	24.71	324.6	0.65	0.07	1496.
30	8.88	32.68	30	25.35	264.5	0.95	0.14	1484.
50	6.34	32.73	50	25.74	226.9	1.44	0.34	1474.
75	5.36	32.78	75	25.90	212.0	1.99	0.69	1471.
100	4.73	32.80	99	25.99	203.8	2.51	1.15	1469.
125	5.18	33.16	124	26.22	181.9	3.00	1.72	1471.
150	5.45	33.60	149	26.54	152.4	3.42	2.30	1473.
175	5.35	33.73	174	26.65	141.7	3.79	2.91	1474.
200	5.08	33.77	199	26.72	135.9	4.13	3.57	1473.
225	4.90	33.80	223	26.76	132.0	4.47	4.29	1473.
250	4.68	33.82	248	26.80	128.3	4.79	5.08	1472.
300	4.31	33.87	298	26.88	121.0	5.41	6.82	1472.
400	3.96	33.98	397	27.00	109.9	6.57	10.93	1472.
500	3.76	34.07	496	27.10	101.8	7.63	15.78	1473.
600	3.65	34.15	595	27.17	95.5	8.61	21.29	1474.
800	3.32	34.29	793	27.31	83.0	10.38	33.85	1476.
1000	2.94	34.38	990	27.42	73.5	11.93	48.10	1478.
1200	2.67	34.45	1188	27.50	66.5	13.34	63.77	1480.
1500	2.39	34.50	1484	27.56	61.2	15.26	90.24	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 29
49-34.0 N 138-40.0 W
MO.-8 DAY-9 GMT-21.7
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 29 DATE 9/ 8/71
POSITION 49-34.0N, 138-40.0W GMT 21.7
RESULTS OF STP CAST 83 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	13.68	32.67	0	24.48	346.5	0.0	0.0	1500.
10	13.66	32.67	10	24.48	346.6	0.35	0.02	1500.
20	13.58	32.67	20	24.50	345.3	0.69	0.07	1500.
30	10.17	32.67	30	25.13	285.1	1.01	0.15	1489.
50	7.62	32.69	50	25.54	246.2	1.54	0.36	1479.
75	5.93	32.77	75	25.83	219.2	2.12	0.73	1473.
100	5.13	32.81	99	25.95	207.4	2.65	1.20	1470.
125	5.08	32.99	124	26.10	193.6	3.16	1.79	1471.
150	5.43	33.46	149	26.43	162.6	3.61	2.42	1473.
175	5.33	33.70	174	26.63	143.8	3.99	3.05	1473.
200	4.90	33.75	199	26.72	135.4	4.34	3.71	1472.
225	4.66	33.78	223	26.77	130.8	4.67	4.43	1472.
250	4.50	33.80	248	26.80	127.8	4.99	5.21	1471.
300	4.21	33.86	298	26.88	120.6	5.61	6.94	1471.
400	3.93	33.96	397	26.99	111.1	6.76	11.06	1472.
500	3.72	34.06	496	27.09	102.2	7.83	15.93	1473.
600	3.58	34.14	595	27.17	95.5	8.82	21.48	1474.
800	3.27	34.28	793	27.31	83.1	10.61	34.18	1476.
1000	2.96	34.38	990	27.42	73.7	12.18	48.57	1478.
1200	2.69	34.45	1188	27.50	66.7	13.59	64.32	1480.
1500	2.37	34.51	1484	27.57	60.3	15.49	90.43	1484.


SALINITY, 0/00
31
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0
300
600
900
1200
1500
PRESSURE, DB
0
4
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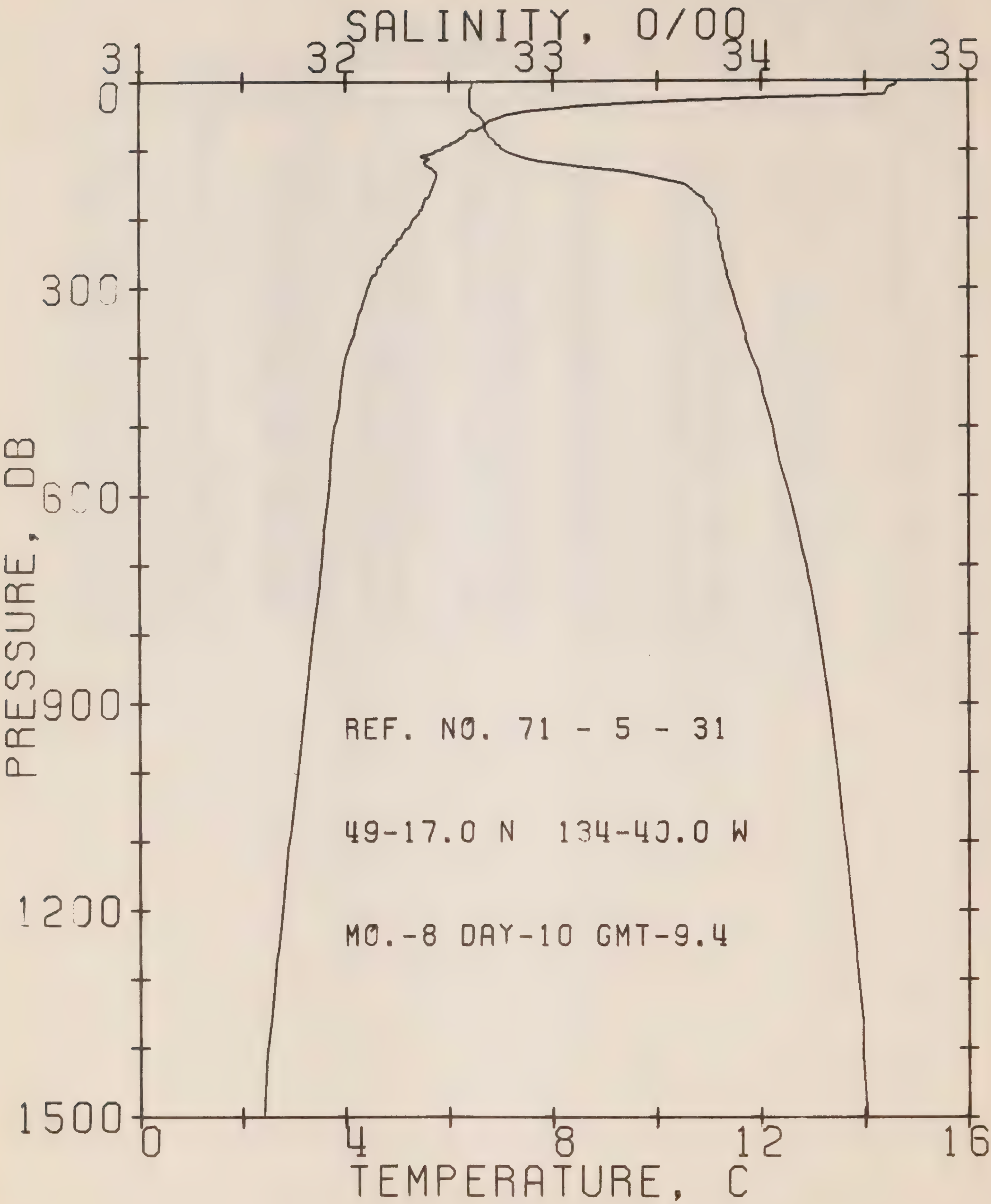
12
16
TEMPERATURE, C
REF. NO. 71 - 5 - 30
49-26.0 N 136-40.0 W
MO.-8 DAY-10 GMT-3.5

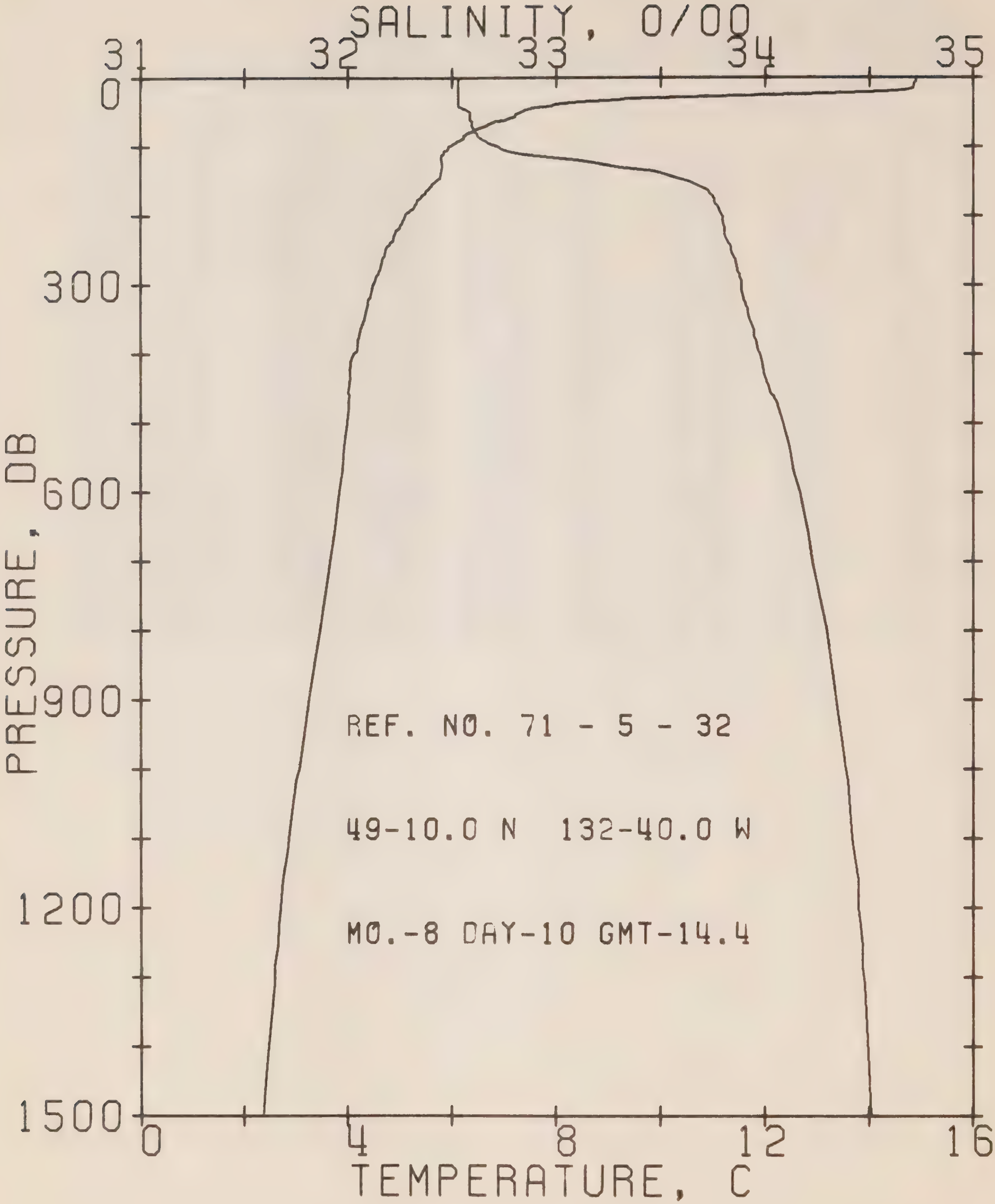
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 30 DATE 10/ 8/71
POSITION 49-26.0N, 136-40.0W GMT 3.5
RESULTS OF STP CAST 117 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	14.25	32.64	0	24.34	359.8	0.0	0.0	1502.
10	14.06	32.64	10	24.38	356.6	0.36	0.02	1502.
20	11.58	32.64	20	24.86	310.8	0.71	0.07	1493.
30	8.91	32.64	30	25.31	267.9	1.00	0.14	1484.
50	6.96	32.67	50	25.62	239.1	1.50	0.35	1477.
75	6.12	32.69	75	25.74	227.5	2.08	0.72	1474.
100	5.90	33.29	99	26.24	180.2	2.60	1.18	1474.
125	6.65	33.70	124	26.47	159.3	3.02	1.66	1478.
150	6.59	33.77	149	26.53	153.6	3.41	2.21	1478.
175	6.33	33.83	174	26.61	146.2	3.79	2.83	1478.
200	6.08	33.86	199	26.67	141.1	4.15	3.52	1477.
225	5.84	33.88	223	26.71	137.3	4.50	4.27	1477.
250	5.61	33.89	248	26.75	133.7	4.83	5.09	1476.
300	5.22	33.92	298	26.82	127.5	5.48	6.91	1475.
400	4.61	33.97	397	26.93	117.7	6.71	11.28	1475.
500	4.21	34.04	496	27.03	109.0	7.84	16.46	1475.
600	3.94	34.13	595	27.13	100.1	8.88	22.29	1475.
800	3.48	34.26	793	27.27	86.9	10.75	35.53	1477.
1000	3.11	34.36	990	27.39	76.8	12.38	50.47	1479.
1200	2.76	34.43	1188	27.48	69.0	13.83	66.71	1481.
1500	2.39	34.50	1484	27.56	61.2	15.78	93.40	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 31
49-17.0 N 134-40.0 W
MO.-8 DAY-10 GMT-9.4
0
4
8
12
16
TEMPERATURE, C

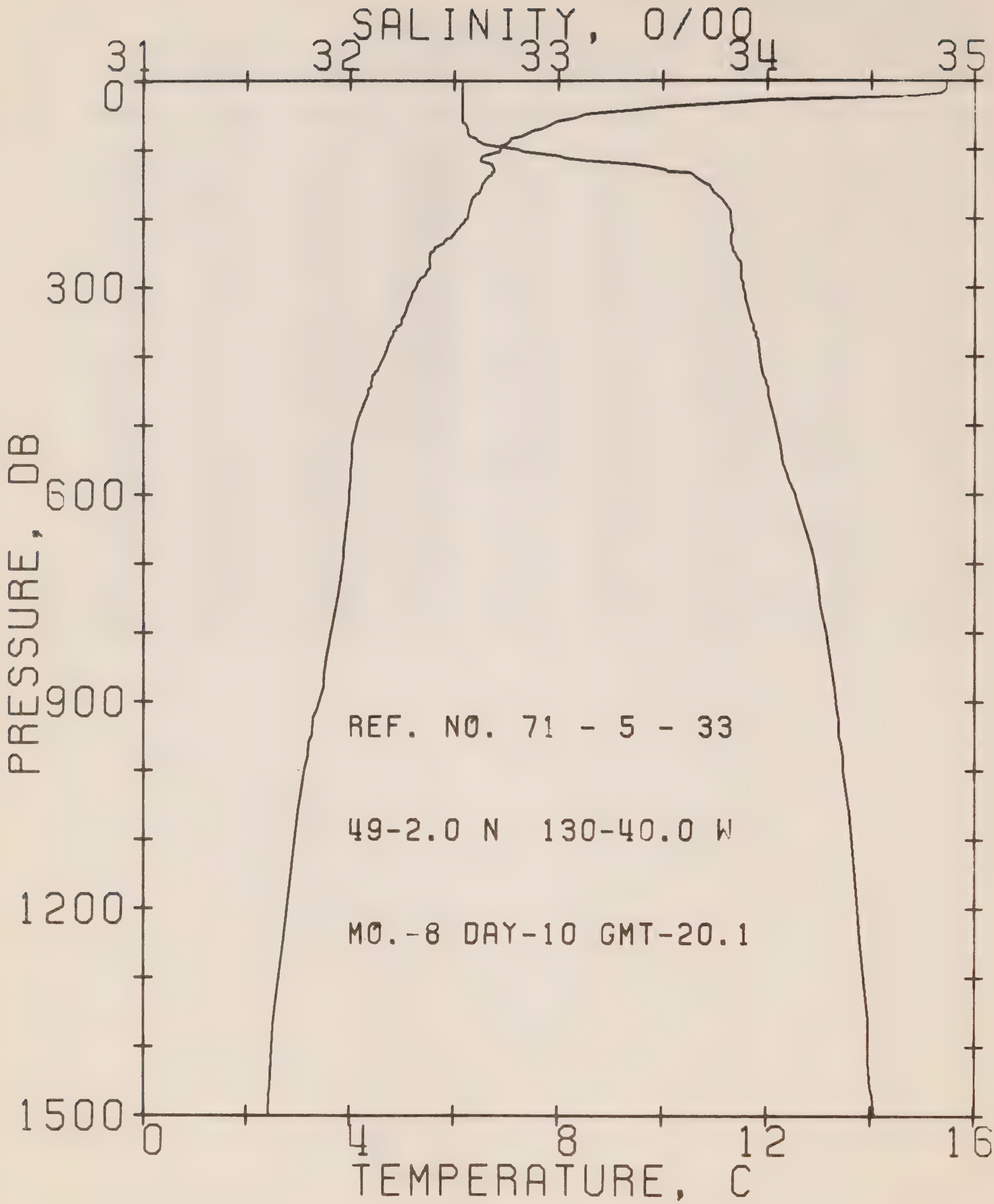
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 31 DATE 10/ 8/71
POSITION 49-17.0N, 134-40.0W GMT 9.4
RESULTS OF STP CAST 100 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	14.62	32.61	0	24.24	369.5	0.0	0.0	1503.
10	14.46	32.60	10	24.26	367.5	0.37	0.02	1503.
20	14.33	32.60	20	24.29	365.1	0.74	0.07	1503.
30	10.08	32.60	30	25.09	288.9	1.06	0.16	1488.
50	7.08	32.65	50	25.58	242.1	1.58	0.37	1477.
75	6.36	32.69	75	25.71	230.4	2.17	0.74	1475.
100	5.78	32.77	99	25.84	217.7	2.73	1.24	1473.
125	5.66	33.16	124	26.17	187.4	3.24	1.83	1473.
150	5.73	33.64	149	26.54	152.7	3.66	2.41	1475.
175	5.56	33.73	174	26.63	144.2	4.03	3.03	1474.
200	5.33	33.79	199	26.70	137.3	4.38	3.70	1474.
225	5.11	33.80	223	26.74	134.3	4.72	4.43	1474.
250	4.83	33.82	248	26.78	129.9	5.05	5.23	1473.
300	4.45	33.86	298	26.86	123.2	5.69	7.01	1472.
400	4.03	33.96	397	26.98	112.2	6.86	11.20	1472.
500	3.80	34.06	496	27.08	103.0	7.94	16.12	1473.
600	3.68	34.14	595	27.16	96.6	8.94	21.73	1474.
800	3.38	34.28	793	27.30	84.3	10.74	34.55	1476.
1000	3.08	34.37	990	27.40	75.8	12.34	49.17	1478.
1200	2.77	34.44	1188	27.48	68.4	13.78	65.28	1481.
1500	2.39	34.51	1484	27.57	60.5	15.70	91.60	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 32
49-10.0 N 132-40.0 W
MO.-8 DAY-10 GMT-14.4
0
4
8
12
16
TEMPERATURE, C

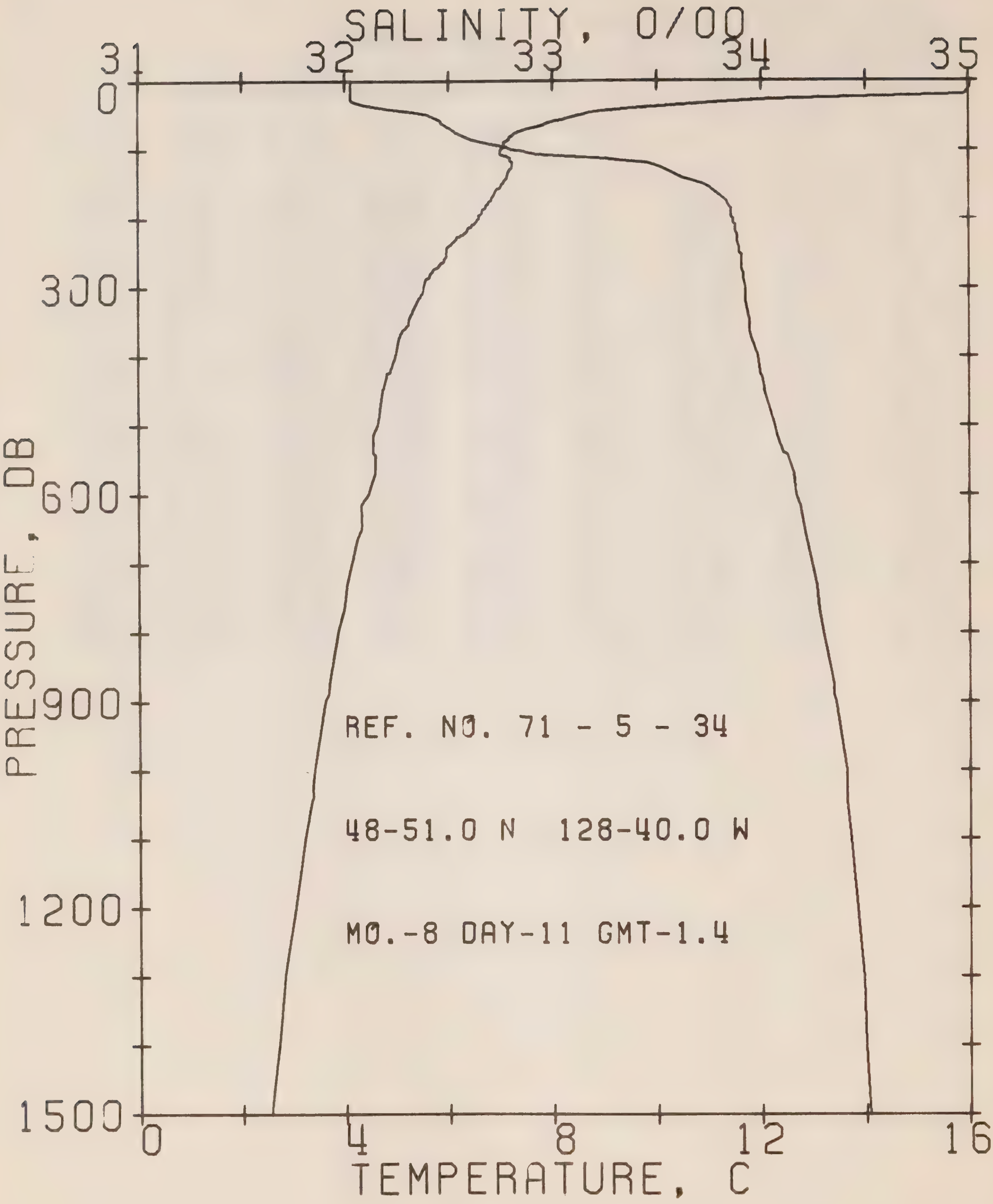
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 32 DATE 10/ 8/71
POSITION 49-10.0N, 132-40.0W GMT 14.4
RESULTS OF STP CAST 109 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	14.93	32.53	0	24.11	381.6	0.0	0.0	1504.
10	14.88	32.53	10	24.12	381.0	0.38	0.02	1504.
20	14.28	32.53	20	24.25	369.3	0.76	0.08	1502.
30	9.38	32.53	30	25.15	283.1	1.09	0.16	1485.
50	7.33	32.59	50	25.50	249.8	1.62	0.37	1478.
75	6.48	32.61	75	25.63	237.8	2.23	0.76	1475.
100	5.96	32.73	99	25.79	222.8	2.81	1.28	1474.
125	5.83	33.22	124	26.19	184.9	3.32	1.87	1474.
150	5.71	33.64	149	26.54	152.4	3.74	2.45	1475.
175	5.40	33.76	174	26.67	140.1	4.10	3.05	1474.
200	5.13	33.80	199	26.73	134.2	4.45	3.71	1473.
225	4.93	33.81	223	26.76	131.6	4.78	4.43	1473.
250	4.75	33.84	248	26.81	127.5	5.10	5.21	1473.
300	4.50	33.89	298	26.88	121.5	5.73	6.96	1472.
400	4.14	33.98	397	26.99	111.8	6.90	11.13	1473.
500	4.01	34.09	496	27.09	103.0	7.97	16.05	1474.
600	3.85	34.17	595	27.17	96.2	8.97	21.64	1475.
800	3.48	34.30	793	27.31	84.0	10.78	34.47	1477.
1000	3.08	34.39	990	27.42	74.3	12.36	48.93	1479.
1200	2.71	34.45	1188	27.50	67.0	13.76	64.61	1480.
1500	2.35	34.51	1484	27.58	60.0	15.65	90.64	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NØ. 71 - 5 - 33
49-2.0 N 130-40.0 W
MØ.-8 DAY-10 GMT-20.1
0
4
8
12
16
TEMPERATURE, C

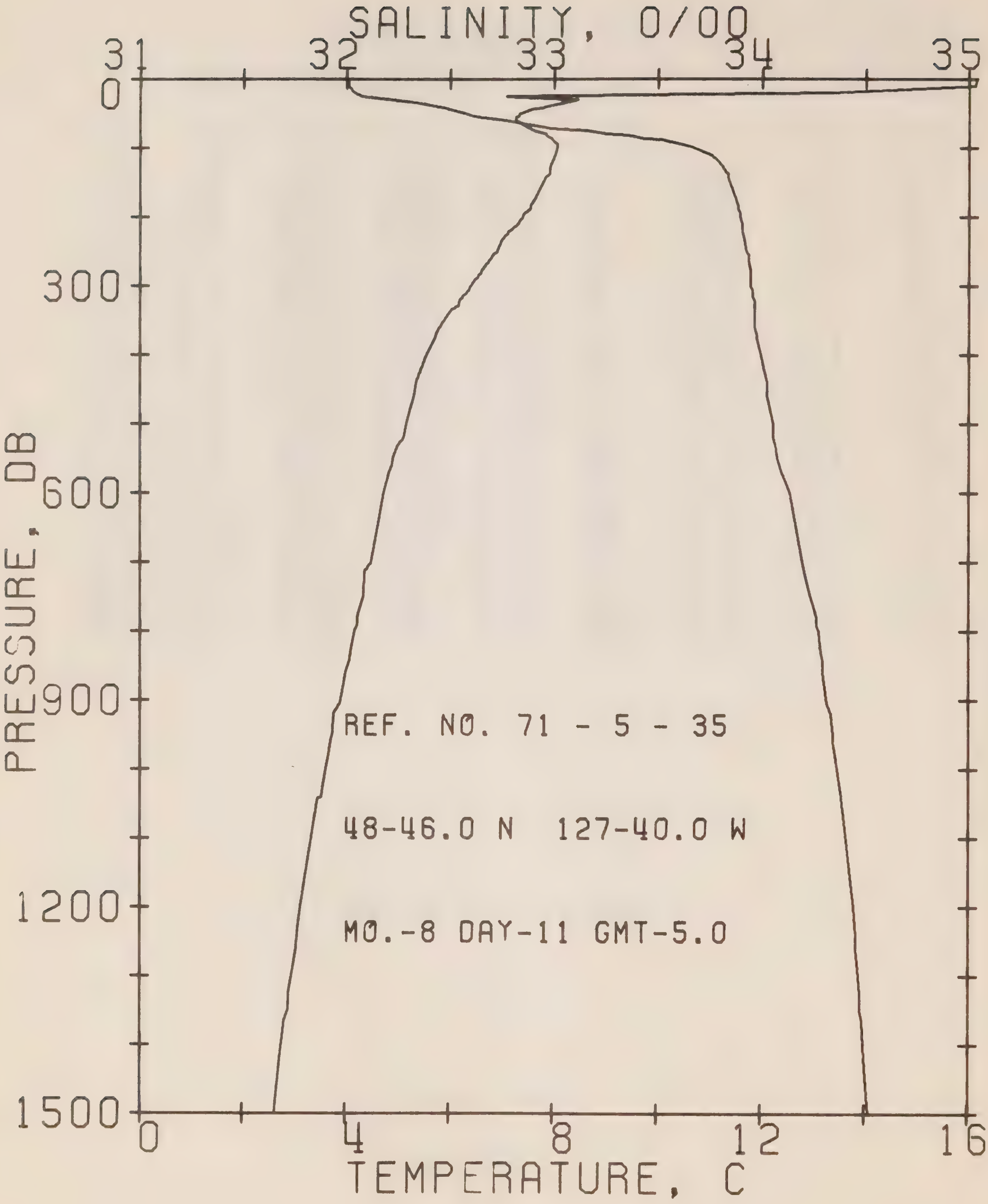
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 33 DATE 10/ 8/71
POSITION 49- 2.0N, 130-40.0W GMT 20.1
RESULTS OF STP CAST 111 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	15.47	32.54	0	24.00	392.1	0.0	0.0	1506.
10	15.47	32.54	10	24.00	392.6	0.39	0.02	1506.
20	15.08	32.54	20	24.08	384.7	0.78	0.08	1505.
30	11.73	32.54	30	24.75	321.0	1.14	0.17	1494.
50	8.52	32.54	50	25.29	269.9	1.72	0.41	1483.
75	7.47	32.57	75	25.47	253.6	2.38	0.82	1479.
100	6.92	32.81	99	25.73	228.8	2.99	1.36	1477.
125	6.73	33.44	124	26.25	179.7	3.50	1.95	1478.
150	6.59	33.71	149	26.48	158.1	3.92	2.54	1478.
175	6.37	33.79	174	26.58	149.4	4.30	3.17	1478.
200	6.28	33.83	199	26.62	145.9	4.67	3.87	1478.
225	6.00	33.83	223	26.65	142.7	5.03	4.65	1477.
250	5.57	33.85	248	26.72	136.3	5.38	5.50	1476.
300	5.31	33.89	298	26.78	130.8	6.05	7.37	1476.
400	4.70	33.97	397	26.92	118.7	7.29	11.79	1475.
500	4.15	34.05	496	27.04	107.8	8.42	16.97	1474.
600	4.00	34.14	595	27.13	100.1	9.46	22.81	1476.
800	3.65	34.29	793	27.28	86.7	11.32	36.04	1478.
1000	3.14	34.37	991	27.39	76.4	12.95	50.91	1479.
1200	2.79	34.44	1188	27.48	68.6	14.39	67.02	1481.
1500	2.40	34.52	1484	27.58	59.9	16.31	93.37	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 34
48-51.0 N 128-40.0 W
MO.-8 DAY-11 GMT-1.4
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 34 DATE 11/ 8/71
POSITION 48-51.0N, 128-40.0W GMT 1.4
RESULTS OF STP CAST 105 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	16.06	32.03	0	23.48	441.9	0.0	0.0	1507.
10	16.05	32.03	10	23.48	442.1	0.44	0.02	1507.
20	15.90	32.03	20	23.51	439.2	0.88	0.09	1507.
30	11.48	32.04	30	24.41	353.5	1.27	0.19	1492.
50	8.53	32.41	50	25.19	279.7	1.90	0.44	1482.
75	7.33	32.54	75	25.46	253.9	2.56	0.86	1478.
100	7.02	32.81	99	25.72	230.1	3.17	1.40	1478.
125	7.25	33.52	124	26.24	180.6	3.68	1.98	1480.
150	7.06	33.73	149	26.43	162.7	4.11	2.59	1480.
175	6.83	33.84	174	26.55	151.9	4.50	3.24	1480.
200	6.61	33.87	199	26.61	147.1	4.87	3.95	1479.
225	6.24	33.89	224	26.67	141.2	5.24	4.73	1478.
250	5.97	33.90	248	26.71	137.4	5.58	5.57	1478.
300	5.55	33.93	298	26.79	130.7	6.25	7.45	1477.
400	5.00	33.99	397	26.90	120.7	7.52	11.94	1476.
500	4.66	34.07	496	27.00	111.9	8,68	17.26	1477.
600	4.47	34.17	595	27.10	103.2	9.75	23.25	1478.
800	3.87	34.30	793	27.27	88.3	11.65	36.75	1478.
1000	3.40	34.41	991	27.40	76.4	13.29	51.76	1480.
1200	3.03	34.46	1188	27.48	69.9	14.76	68.22	1482.
1500	2.52	34.52	1484	27.57	61.3	16.72	95.08	1485.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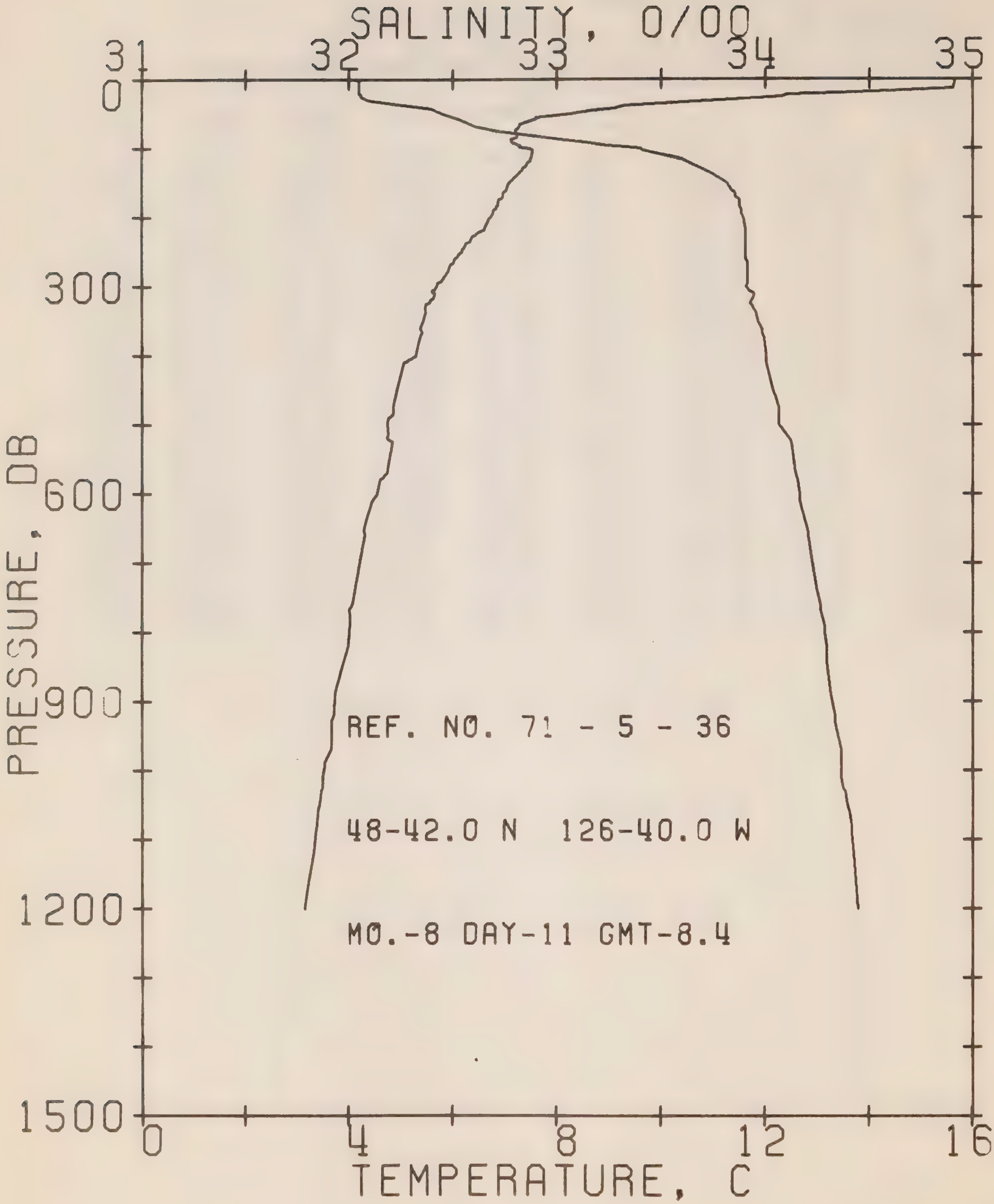
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 35
48-46.0 N 127-40.0 W
MO.-8 DAY-11 GMT-5.0
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 35 DATE 11/ 8/71
POSITION 48-46.0N, 127-40.0W GMT 5.0
RESULTS OF STP CAST 90 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	16.17	32.01	0	23.44	445.7	0.0	0.0	1507.
10	16.14	32.01	10	23.44	445.6	0.45	0.02	1507.
20	13.37	32.04	20	24.05	387.5	0.86	0.08	1499.
30	8.48	32.23	30	25.06	292.1	1.17	0.16	1482.
50	7.36	32.58	50	25.49	251.0	1.71	0.38	1478.
75	7.60	33.16	75	25.91	211.4	2.30	0.75	1480.
100	8.09	33.68	99	26.25	180.0	2.78	1.18	1483.
125	7.96	33.81	124	26.37	168.8	3.22	1.68	1483.
150	7.83	33.85	149	26.42	164.4	3.63	2.26	1483.
175	7.65	33.88	174	26.47	160.1	4.04	2.93	1483.
200	7.43	33.90	199	26.52	155.9	4.43	3.69	1483.
225	7.12	33.91	223	26.57	151.0	4.82	4.52	1482.
250	6.94	33.93	248	26.61	147.7	5.19	5.42	1481.
300	6.43	33.95	298	26.69	140.2	5.91	7.43	1480.
400	5.58	34.00	397	26.84	127.0	7.24	12.16	1479.
500	5.19	34.06	496	26.93	118.9	8.46	17.79	1479.
600	4.75	34.14	595	27.05	108.7	9.61	24.20	1479.
800	4.19	34.28	793	27.22	93.6	11.64	38.64	1480.
1000	3.63	34.37	991	27.35	82.0	13.40	54.71	1481.
1200	3.14	34.45	1188	27.46	71.9	14.93	71.82	1482.
1500	2.60	34.52	1484	27.56	62.2	16.94	99.42	1485.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31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 5 - 36
48-42.0 N 126-40.0 W
MO.-8 DAY-11 GMT-8.4
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 5- 36 DATE 11/ 8/71
POSITION 48-42.0N, 126-40.0W GMT 8.4
RESULTS OF STP CAST 103 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	15.68	32.05	0	23.58	432.3	0.0	0.0	1506.
10	15.65	32.05	10	23.58	432.2	0.43	0.02	1506.
20	13.43	32.05	20	24.05	387.9	0.85	0.08	1499.
30	11.13	32.10	30	24.52	343.1	1.21	0.18	1491.
50	8.28	32.46	50	25.26	272.5	1.81	0.42	1482.
75	7.20	32.72	75	25.62	238.8	2.44	0.82	1478.
100	7.48	33.41	99	26.13	191.5	2.98	1.30	1480.
125	7.42	33.67	124	26.34	171.7	3.44	1.82	1481.
150	7.10	33.82	149	26.50	156.6	3.85	2.39	1480.
175	6.91	33.88	174	26.57	149.9	4.23	3.03	1480.
200	6.74	33.90	199	26.61	146.6	4.60	3.74	1480.
225	6.45	33.91	223	26.66	142.4	4.96	4.52	1479.
250	6.18	33.91	248	26.69	139.3	5.32	5.37	1478.
300	5.72	33.91	298	26.75	134.2	6.00	7.28	1477.
400	5.32	34.01	397	26.88	123.1	7.27	11.81	1478.
500	4.74	34.07	496	26.99	112.8	8.44	17.17	1477.
600	4.58	34.17	595	27.09	104.4	9.52	23.24	1478.
800	4.03	34.29	793	27.24	91.0	11.46	37.00	1479.
1000	3.53	34.37	991	27.36	80.8	13.18	52.73	1480.
1200	3.14	34.45	1188	27.46	71.9	14.70	69.73	1482.

SURFACE TEMPERATURE AND SALINITY OBSERVATIONS

(P-71-5)

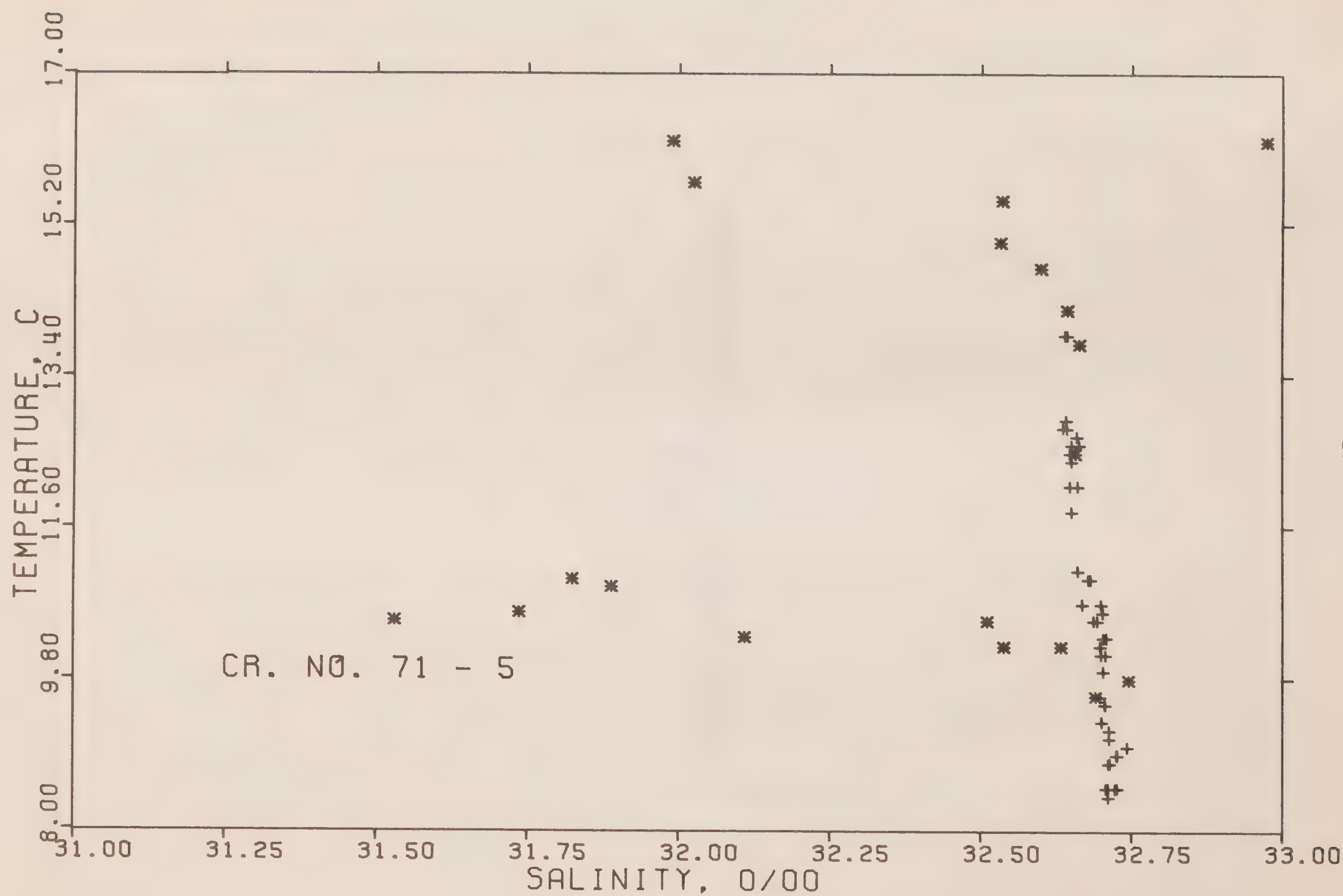


Fig. 16 T-S plot of surface temperature and salinity observations on Line P (asterisks) and at Station P (pluses) during cruise P-71-5.

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 5

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	6	25	2243	31.889	10.9	125-33
71	6	26	40	31.530	10.5	125-58
71	6	26	300	31.824	11.0	126-40
71	6	26	710	31.736	10.6	127-40
71	6	26	1030	32.109	10.3	128-40
71	6	26	1610	32.510	10.5	130-40
71	6	26	2200	32.537	10.2	132-40
71	6	27	335	32.632	10.2	134-40
71	6	27	935	32.632	10.2	136-40
71	6	27	1845	32.745	9.8	138-40
71	6	28	110	32.690	9.6	140-40
71	6	28	815	32.743	9.0	142-40
71	6	29	0	32.722	8.5	ON STATION
71	6	30	0	32.711	8.4	ON STATION
71	7	1	0	32.708	8.5	ON STATION
71	7	2	0	32.711	8.5	ON STATION
71	7	3	0	32.711	8.8	ON STATION
71	7	4	0	32.726	8.5	ON STATION
71	7	5	0	32.726	8.9	ON STATION
71	7	6	0	32.725	8.9	ON STATION
71	7	7	0	32.712	9.1	ON STATION
71	7	8	0	32.712	9.2	ON STATION
71	7	9	0	32.714	8.8	ON STATION
71	7	10	0	32.697	9.6	ON STATION
71	7	11	0	32.706	9.5	ON STATION
71	7	12	0	32.700	9.3	ON STATION
71	7	13	0	32.705	9.5	ON STATION
71	7	14	0	32.703	10.3	ON STATION
71	7	15	0	32.706	10.1	ON STATION
71	7	16	0	32.703	9.9	ON STATION
71	7	17	0	32.708	10.3	ON STATION
71	7	18	0	32.699	10.1	ON STATION
71	7	19	0	32.698	10.2	ON STATION
71	7	20	0	32.692	10.5	ON STATION
71	7	21	0	32.701	10.6	ON STATION
71	7	22	0	32.699	10.7	ON STATION
71	7	23	0	32.686	10.5	ON STATION
71	7	24	0	32.681	11.0	ON STATION
71	7	25	0	32.677	11.0	ON STATION
71	7	26	0	32.667	10.7	ON STATION
71	7	27	0	32.660	11.1	ON STATION
71	7	28	0	32.650	11.8	ON STATION
71	7	29	0	32.647	12.1	ON STATION
71	7	30	0	32.648	12.5	ON STATION
71	7	31	0	32.641	12.9	ON STATION
71	8	1	0	32.643	13.9	ON STATION
71	8	2	0	32.639	13.9	ON STATION
71	8	3	0	32.636	12.8	ON STATION
71	8	4	0	32.656	12.5	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 5

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	8	4	0	32.656	12.5	ON STATION
71	8	5	0	32.660	12.1	ON STATION
71	8	6	0	32.662	12.6	ON STATION
71	8	7	0	32.650	12.4	ON STATION
71	8	8	0	32.650	12.6	ON STATION
71	8	9	0	32.643	12.8	ON STATION
71	8	9	900	32.659	12.7	142-40
71	8	9	1530	32.656	12.5	140-40
71	8	9	2130	32.662	13.8	138-40
71	8	10	330	32.643	14.2	136-40
71	8	10	925	32.599	14.7	134-46
71	8	10	1425	32.531	15.0	132-40
71	8	10	2007	32.534	15.5	130-40
71	8	11	125	32.974	16.2	128-40
71	8	11	500	31.989	16.2	127-40
71	8	11	824	32.024	15.7	126-40

MARINE SCIENCES BRANCH, PACIFIC REGION

PACIFIC MARINE SCIENCES REPORT NO. 72-2

OCEANOGRAPHIC OBSERVATIONS AT OCEAN STATION P (50^oN, 145^oW)

VOLUME 52

AUGUST 6, 1971 - JANUARY 16, 1972

by

R. Bellegay, W. Hansen and D. Healey
Marine Sciences Branch
Environment Canada

and

J.H. Linggard, Master, CCGS VANCOUVER
Marine Sciences Branch
Ministry of Transport

Victoria, B.C.
Marine Sciences Branch
Environment Canada
May, 1972

INTRODUCTION

Canadian operation of Ocean Weather Station P (latitude 50°00'N, longitude 145°00'W) was inaugurated in December, 1950. The station is manned by two vessels operated by the Marine Services Branch of the Ministry of Transport. They are the CCGS VANCOUVER and the CCGS QUADRA. Each ship remains on station for a period of six weeks, and is then relieved by the alternative ship, thus maintaining a continuous watch. The chief purpose of the station is to operate as a meteorological station for surface and upper-air observations and as an air-sea rescue station.

Bathythermograph observations have been made at Station P since July, 1952. A program of more extensive oceanographic observations was commenced in August, 1956. This was further extended in April, 1959, by the addition of a series of oceanographic stations along the route to and from Station P and Swiftsure Bank. These stations are known as Line P stations. The number of stations on Line P has been increased twice and now consists of twelve stations (Fig. 1). Bathythermograph observations and surface salinity sample collections in addition to being made on Line P oceanographic stations are also made at odd meridians at 40' i.e. 139°40'W, 141°40'W, etc. Data observed prior to 1968 has been indexed by Collins et al, (1969).

The present record includes hydrographic and salinity-temperature-pressure data collected from the QUADRA during the period August 6 to September 22, 1971, hydrographic data from the VANCOUVER during the period September 17 to November 3, 1971, hydrographic and salinity-temperature-pressure data from the QUADRA during the period October 28 to December 8, 1971 and surface temperature and salinity data from the VANCOUVER during the period December 3, 1971 to January 16, 1972.

All physical data has been archieved by the Canadian Oceanographic Data Centre (CODC), 615 Booth Street, Ottawa, Ontario, Canada. Requests for these data should be directed to CODC.

Biological and productivity data are published in the Manuscript Report series of the Fisheries Research Board of Canada (FRB), The Biological Station, Nanaimo, B.C., Canada. Requests for these data should be directed to FRB.

Marine Geochemical data are for the Ocean Chemistry Group, Marine Sciences Branch, Department of the Environment, the Biological Station, Nanaimo, B.C., Canada.

Bird observations are sent to Dr. M. Myres, University of Calgary, Calgary, Alberta, Canada; and Marine Mammal observations to Mr. I. McAskie, Fisheries Research Board of Canada, The Biological Station, Nanaimo, B.C. Canada.

Program of observations from CCGS QUADRA, 6 August to 22 September, 1971 (P-71-6) (CODC Ref. No. 02-71-006)

Oceanographic observations were made by Mr. R. Bellegay, Marine Sciences Branch, Department of the Environment.

En route to Station P Line P oceanographic Stations 1 to 12 were occupied and STD casts made to near bottom or 1500 meters. At Stations 4 and 9 sampling was continued to 2400 and 3500 meters with water bottles. BT casts were made and surface salinity and nitrate samples were collected at all Line P oceanographic and BT Stations.

I) Physical Oceanography

On Station P profiles of salinity, temperature and oxygen were obtained as follows:

1) Weekly bottle casts to near bottom (4200 meters).
2) Weekly STD casts to 1500 meters following bottle casts.
3) Twice weekly STD casts to 300 meters.
4) Mechanical BT casts 8 times daily.
5) Bucket surface salinity sample daily at 0000 hrs. GMT.

Other observations made and data obtained at Station P were as follows:

II) Biological and Productivity

These data were collected as follows:

1) Plankton
   A total of 25 - 50 meter, 25 - 150 meter, 2 - 1200 meter vertical hauls and 7 - 10 minute horizontal tows.
2) Three profiles and 3 surface samples for pigment, nitrate and C_{14} productivity.
3) Weekly secchi disk depth measurements.

III) Marine Geochemistry

Samples for Marine Geochemical studies were obtained as follows:

1) Oxygen - Weekly at standard depths from the hydrographic cast.
2) Nutrient samples for silicate, nitrate and phosphate daily from the ship's seawater loop plus one hourly sampling for 48 hours. A profile was taken from one hydrographic cast.
3) Alkalinity samples every three days from the seawater loop.
4) Two $C^{14}O_2$ samples from the seawater loop.
5) Air samples for CO_2 analysis once a week.

IV) Marine Mammal, Bird and Data Gathered for Other Institutes

1) Marine mammal and bird observations were recorded.
2) Samples from ten deep trawls sent to the Museum of Natural History in Ottawa and the Biological Station Nanaimo by Captain Dykes.
3) One salmon was caught in the fishing program.

En route from Station P oceanographic Station 12 through 1 were occupied and STD casts made to 1500 meters or near bottom. At Station 9 sampling was continued to 3500 meters with water bottles. BT casts were made and surface salinity and nitrate samples were collected at all Line P oceanographic and BT Stations.

Due to malfunction of STD only STD temperature data from Stations 38-50 inc. are included in this report.

Program of observations from CCGS VANCOUVER, September 17 to November 3, 1971. (P-71-7) (CODC Ref. No. 02-71-007)

Oceanographic observations were made by Mr. W. Hansen, Marine Sciences Branch, Department of the Environment.

En route to Station P bathythermograph casts were made and surface salinity and nitrate samples taken at all Line P oceanographic and BT Stations.

I) Physical Oceanography

On Station P profiles of salinity, temperature and oxygen obtained as follows:

1) 4 bottle casts to near bottom (4200 meters) and one to 600 meters.
2) BT casts 8 times daily.
3) Bucket surface salinity sample daily at 0000 hrs G.M.T.

II) Biological and Productivity

These data were collected as follows:

1) Plankton
A total of 16 - 50 and 150 meter, 2 - 1200 meter vertical hauls and 7 - 10 minute horizontal tows. Daily micro-organism samples from the ship's seawater loop.
2) One profile sampling for pigment, nitrate and C_{14} productivity.
3) One secchi disk depth measurement.

III) Marine Geochemistry

Samples for Marine Geochemistry studies were obtained as follows:

1) Oxygen - at standard depths from hydrographic casts.

2) Nutrient samples for silicate, nitrate and phosphate daily from the seawater loop plus hourly samples for one 48 hour period. A profile sampling was also taken from one hydrographic cast.
3) Alkalinity samples once every three days from the seawater loop.
4) Two surface $C^{14}O_2$ sample from the seawater loop.
5) Air samples for CO_2 analysis once a week.

IV) Marine Mammal, Bird and Data Gathered for Other Institutes

1) Marine mammal and bird observations were recorded.
2) The fishing program produced 9 fish.
3) A rain water sample was collected for Scripps Institute of Oceanography.

En route from Station P the hydrographic program was cancelled due to bad weather. BT casts were made and surface salinity and nitrate samples were collected at Line P oceanographic Stations.

Program of observations from CCGS QUADRA, October 29 to December 8, 1971. (P-71-8) (CODC Ref. No. 02-71-008)

Oceanographic observations were made by Mr. D. Healey of the Marine Sciences Branch, Department of the Environment.

En route to Station P the hydrographic program was cancelled due to bad weather. Nine BT casts were made and surface salinity and nitrate samples were collected at all Line P Stations. The surface temperature recorder was operated continuously on Line P.

I) Physical Oceanography

On Station P profiles of salinity, temperature and oxygen were obtained as follows:
(Weather conditions on this cruise were such that the normal sampling program was not possible.)

1) A total of 3 bottle casts to near bottom (4200 meters).
2) A total of 16 - 1500 meter and 4 - 300 meter STD casts.
3) BT casts 8 times daily.
4) Surface salinity sample daily at 0000 hrs G.M.T.

Other observations made and data obtained at Station P were as follows:

II) Biological and Productivity

These data were collected as follows:

1) Plankton
A total of 12 - 150 meter, 1 - 1200 meter vertical hauls and 7 - 10 minute horizontal tows. Daily micro-organism

samples from the ships seawater loop (weather permitting).
2) Two profiles for pigment, nitrate and C-14 productivity and surface samples every other week.
3) Weekly secchi disk depth measurements.

III) Marine Geochemistry

Samples for Marine Geochemical studies were obtained as follows:

1) Oxygen profiles from the hydrographic casts.
2) Nutrient samples for silicate, nitrate and phosphate daily from the seawater loop and hourly for one 24 hour period. Profile sampling from one hydrographic cast.
3) Alkalinity samples once every three days from the seawater loop.
4) Two seawater $C^{14}O_2$ sample from the seawater loop.
5) Weekly air samples for CO_2 analysis.

IV) Marine Mammal, Bird and Data Gathered for Other Institutes

1) Marine mammal and bird observations were recorded.
2) The fishing program produced 45 salmon.
3) A C^{14} profile for the University of Washington was made.
4) Rainwater samples for Scripps Institute of Oceanography were collected.

En route from Station P Line P Stations 12 through 5 were occupied and STD casts to 1500 meters were made. Bad weather forced the cancellation of hydrographic observations at Stations 4 through 1. BT casts were made and surface salinity and nitrate samples obtained at Line P hydrographic and BT Stations 12 through 5. The temperature recorder was operated continuously along the entire length of Line P.

Program of observations from CCGS VANCOUVER, December 3, 1971 to January 16, 1972. (P-71-9) (CODC Ref. No. 02-71-009).

Oceanographic observations were made by the ship's officers.

En route to Station P 4 XBT casts were made and surface salinity, nitrate and nutrient samples were obtained at Line P stations.

I) Physical Oceanography

1) Mechanical BT casts 8 times daily.
2) Surface salinity sample daily at 0000 hrs G.M.T.

Other observations made and data obtained at Station P were as follows:

II) Marine Geochemistry

Samples for Marine Geochemical studies were obtained as follows:

1) Daily surface nutrient samples.
2) 3 surface alkalinity samples.
3) Weekly air samples for CO_2 analysis.

III) Marine Mammal, Bird and Data Observations for Other Institutes

1) Marine mammal and bird observations were recorded.

En route from Station P only surface salinity, nutrient and nitrate samples were obtained at Line P stations.

Data was processed by Messrs. R. Bellegay, W. Hansen, D. Healey and D. Smith, and assembled and edited for publication by Mr. K. Abbott-Smith.

Observational Procedures

Temperatures at depth were measured by deep-sea reversing thermometers of German (Richter and Wiese) or Japanese (Yoshino Keiki Co.) manufacture. Two protected thermometers were used on all Nansen bottles, and one unprotected thermometer was used on each bottle at depths of 300 m or greater. The accuracy of protected reversing thermometers is believed to be ±0.02C.

Surface water temperatures were measured from a bucket sample using a deck thermometer of ±0.1C accuracy.

Salinity determinations were made aboard ship with either an Auto-Lab Model 601 Mark 111 inductive salimoneter or a Hytech Model 6220 lab salinometer. Accuracy using duplicate determinations is estimated to be ±0.003 ppt.

Depth determinations were made using the "depth difference" method described in the U.S.N. Hydrographic Office Publication No. 607 (1955). Depth estimates have an approximate accuracy of ±5 m for depths less than 1000 m, and ±0.5% of depth for depths greater than 1000 m.

The dissolved oxygen analyses were done in the shipboard laboratory by a modified Winkler method (Carpenter, 1965).

Salinity-temperature-pressure data were obtained with a Bissett-Berman Model 9006 STD on cruises P-71-6 and P-71-8.

Line P engine intake continuous temperatures were recorded by a Honeywell Model 15303836 Recorder. The temperature probe is at a depth of approximately 4 meters and the instrument accuracy is believed to be ± .1C.

Computations

All hydrographic data were processed with the aid of an IBM 360 computer. Reversing thermometer temperature corrections, thermometric depth calculations, and accepted depth from the "depth difference" method were computed. Extraneous thermometric depths caused by thermometer malfunctions are automatically edited and replaced. A Calcomp 563 Offline Plotter was used to plot temperature-salinity and temperature-oxygen diagrams, as well as plots of temperature, salinity and dissolved oxygen vs $\log_{10}$ depth. These plots were used to check the data for errors.

Missing hydrographic data were obtained using a weighted parabolas interpolation method (Reiniger and Ross, 1968). These data are indicated with an asterisk in this data record.

Data values that we suspect but are included in this data record are indicated with a plus. These data have been removed from punch card and magnetic tape records.

Analog records from the salinity-temperature-pressure instrument have been hand digitized, then replotted using the Calcomp Plotter. Digitization was continued until original and computer plotted traces were coincident. Temperature and salinity values were listed at standard pressures; integrals (depths, geopotential anomaly, and potential energy anomaly) were computed from the entire array of digitized data.

The headings for the data listings are explained as follows:

PRESS	is pressure (decibars)
TEMP	is temperature (degrees Celsius)
SAL	is salinity (parts per thousand)
DEPTH	is reported in meters
SIGMA-T	is specific gravity anomaly
SVA	is specific volume anomaly
THETA	is potential temperature (degrees Celsius)
SVA (THETA)	is potential specific volume anomaly
DELTA D	is geopotential anomaly (J/kg)
POT EN	is potential energy in units of 10^8 ergs/cm^2
OXY	is the concentration of dissolved oxygen expressed in milliliters per liter
V-B PERIOD	is the Väisälä-Brunt period in minutes

Summary of Hydrographic Data

The data are graphically summarized as follows:

Composite plots of temperature vs $\log_{10}$ depth (Figs. 3, 4, P-71-6), (Fig. 10, P-71-7) and (Fig. 16, P-71-8).

Composite plots of salinity vs $\log_{10}$ depth (Figs. 5, 6, P-71-6), (Fig. 11, P-71-7) and (Fig. 17, P-71-8).

Composite plots of oxygen vs $\log_{10}$ depth (Figs. 7, 8, P-71-6), (Fig. 12, P-71-7) and (Fig. 18, P-71-8).

REFERENCES

Carpenter, J.H. 1965. The Chesapeake Bay Institute Technique for the Winkler Dissolved Oxygen Method. Limmnol. & Oceaogr., 10: 141-143.

Collins, C.A., R.L. Tripe, D.A. Healey, and J. Joergensen, 1969. The Time Distribution of Serial Oceanographic Data from the Ocean Station P Program. Fisheries Research Board of Canada, Technical Report No. 106.

Reiniger, R.F. and C.K. Ross, 1968. A Method of Interpolation with Application to Oceanographic Data. Deep Sea Re. 15: 185-193.

U. S. N. Hydrographic Office, 1955. Instruction Manual for Oceanographic Observations, Publication No. 607.

LIST OF FIGURES

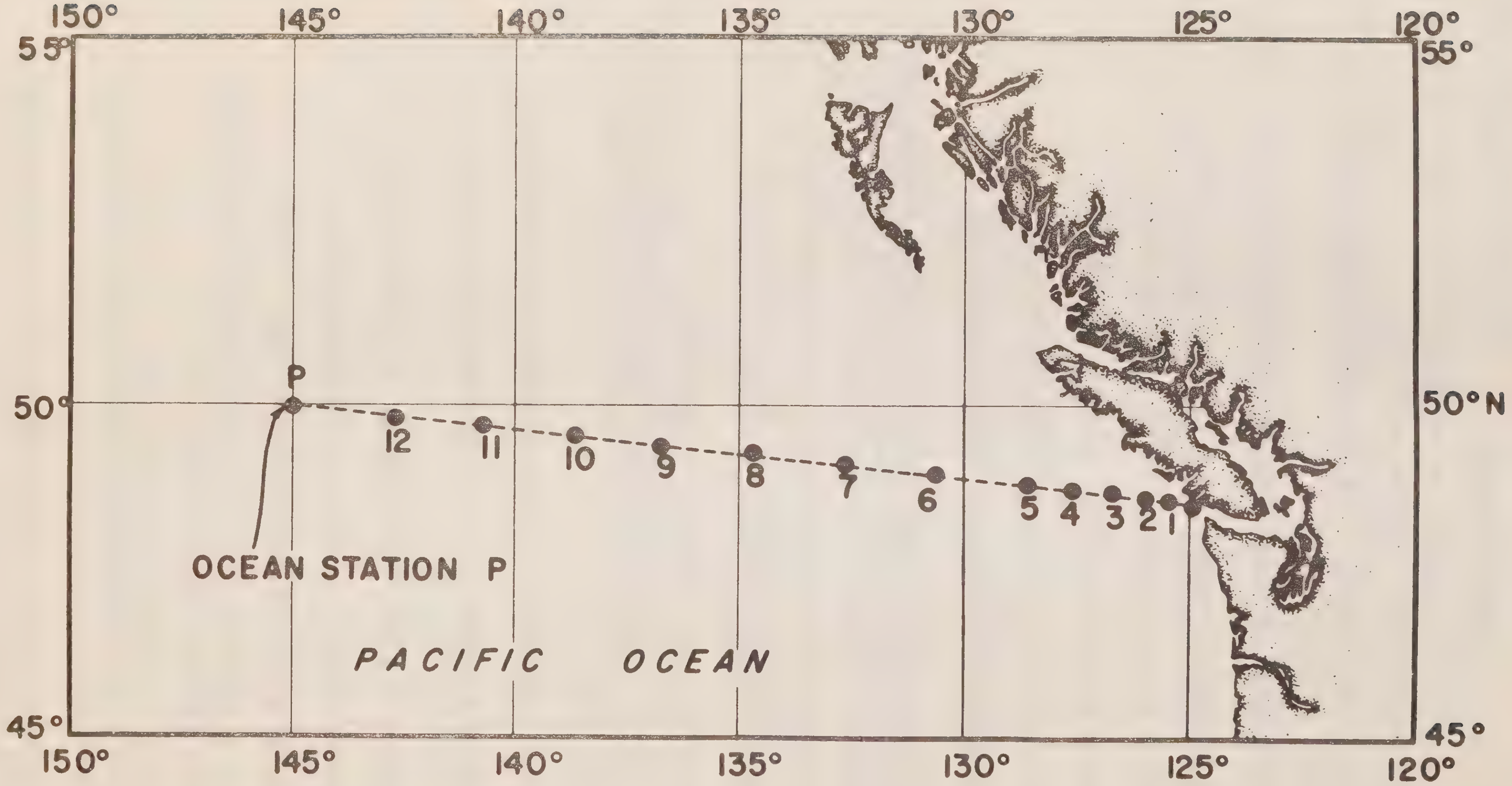


Fig. 1 Chart showing Line P station positions.

OCEANOGRAPHIC DATA OBTAINED ON CRUISE P-71-6

(C.O.D.C. REFERENCE NO. 02-71-006)

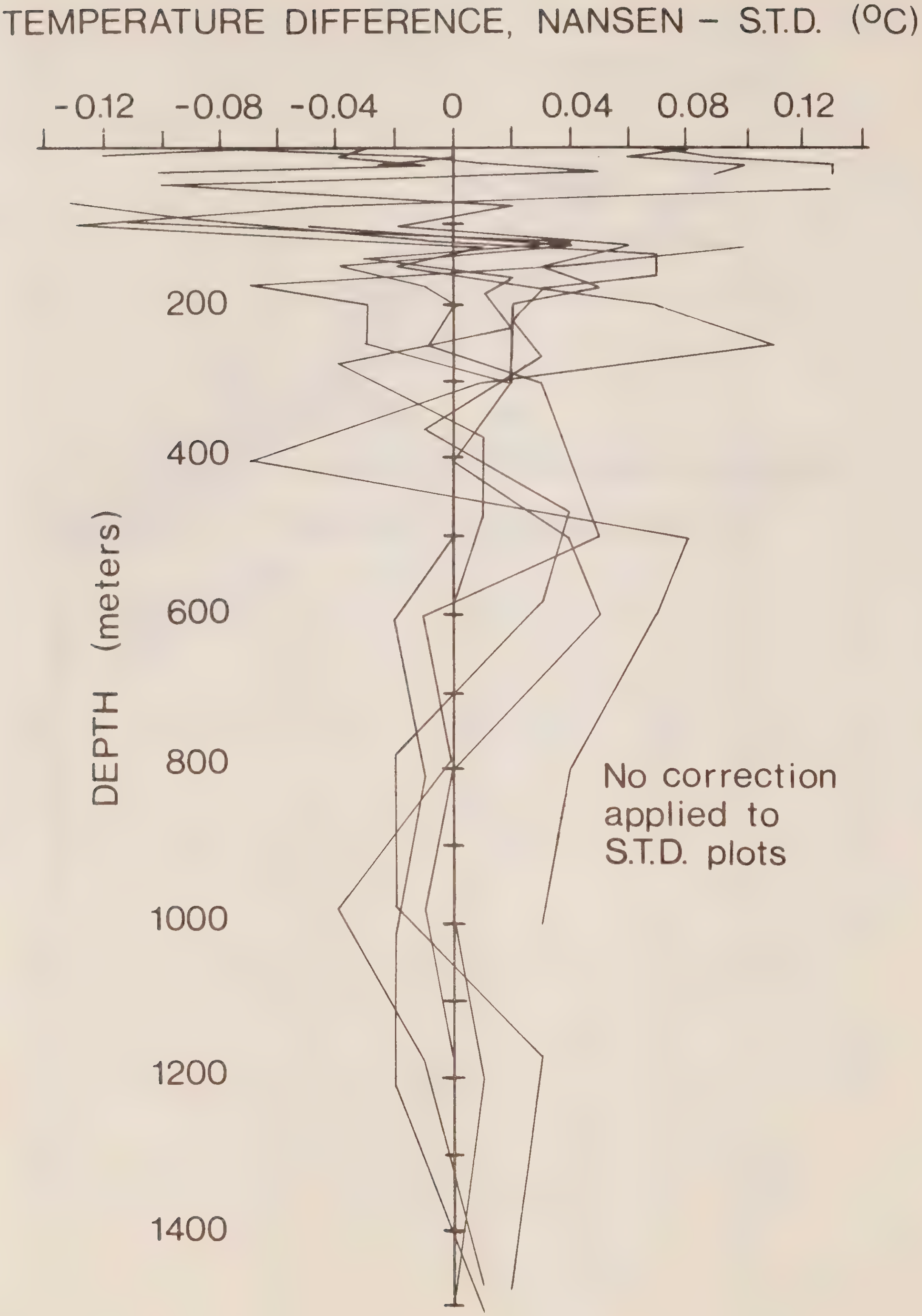


Fig. 2 Reversing thermometer - STD temperature difference Profiles - P-71-6.

COMPOSITE PLOTS OF TEMPERATURE, SALINITY

AND DISSOLVED OXYGEN VS DEPTH

(P-71-6)

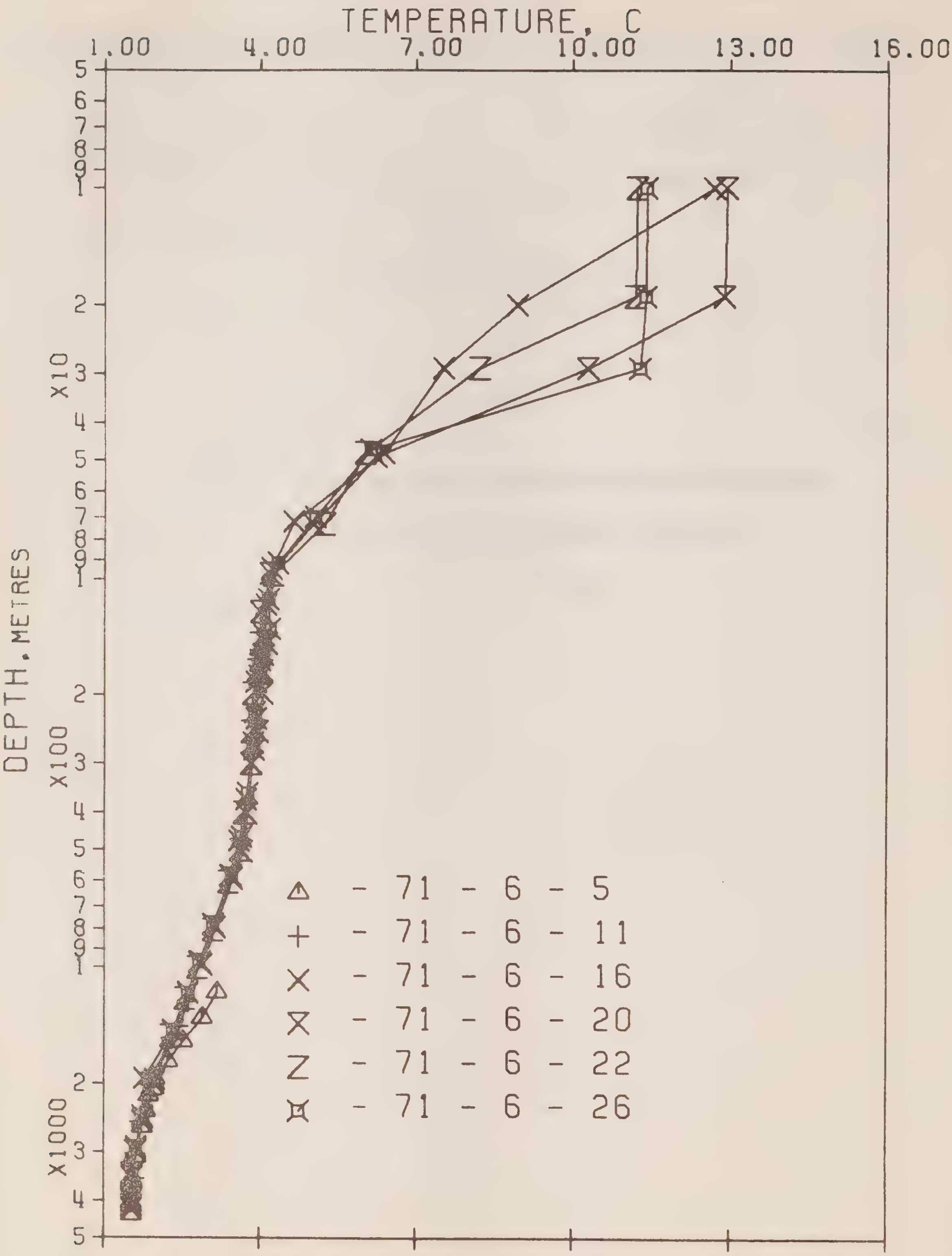


Fig. 3 Composite plot of temperature vs $\log_{10}$ depth P-71-6.

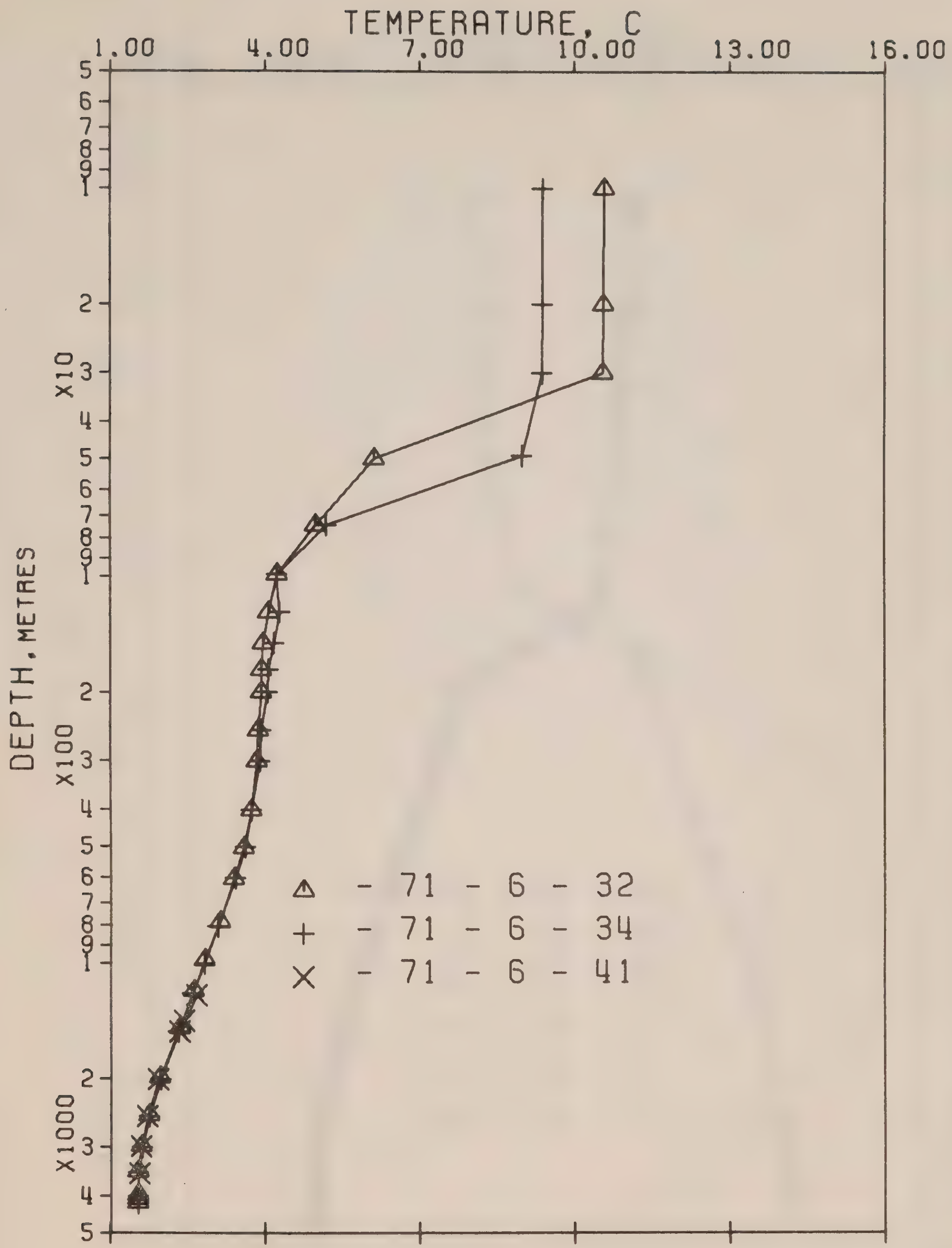


Fig. 4 Composite plot of temperature vs $\log_{10}$ depth P-71-6.

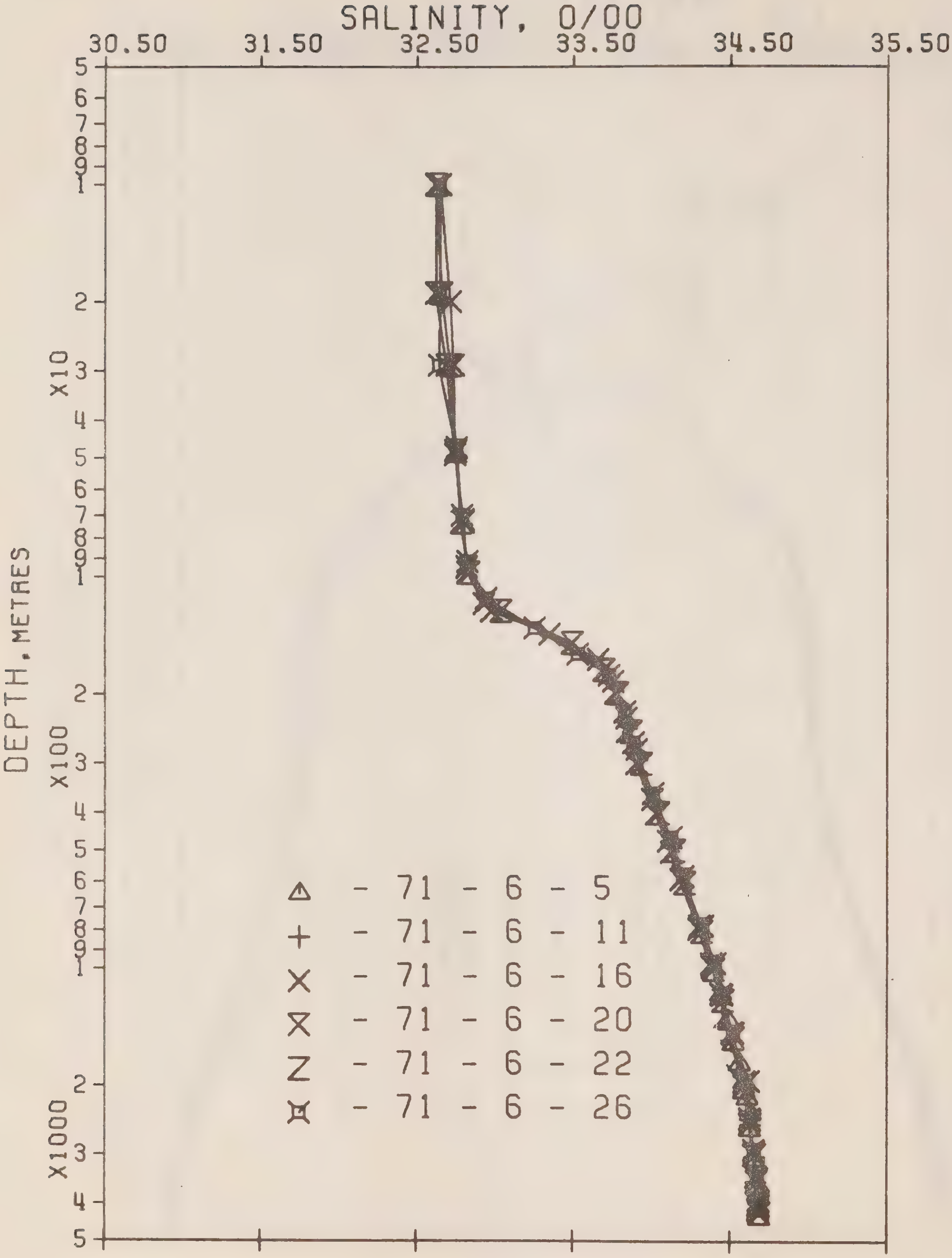


Fig. 5 Composite plot of salinity vs $\log_{10}$ depth P-71-6.

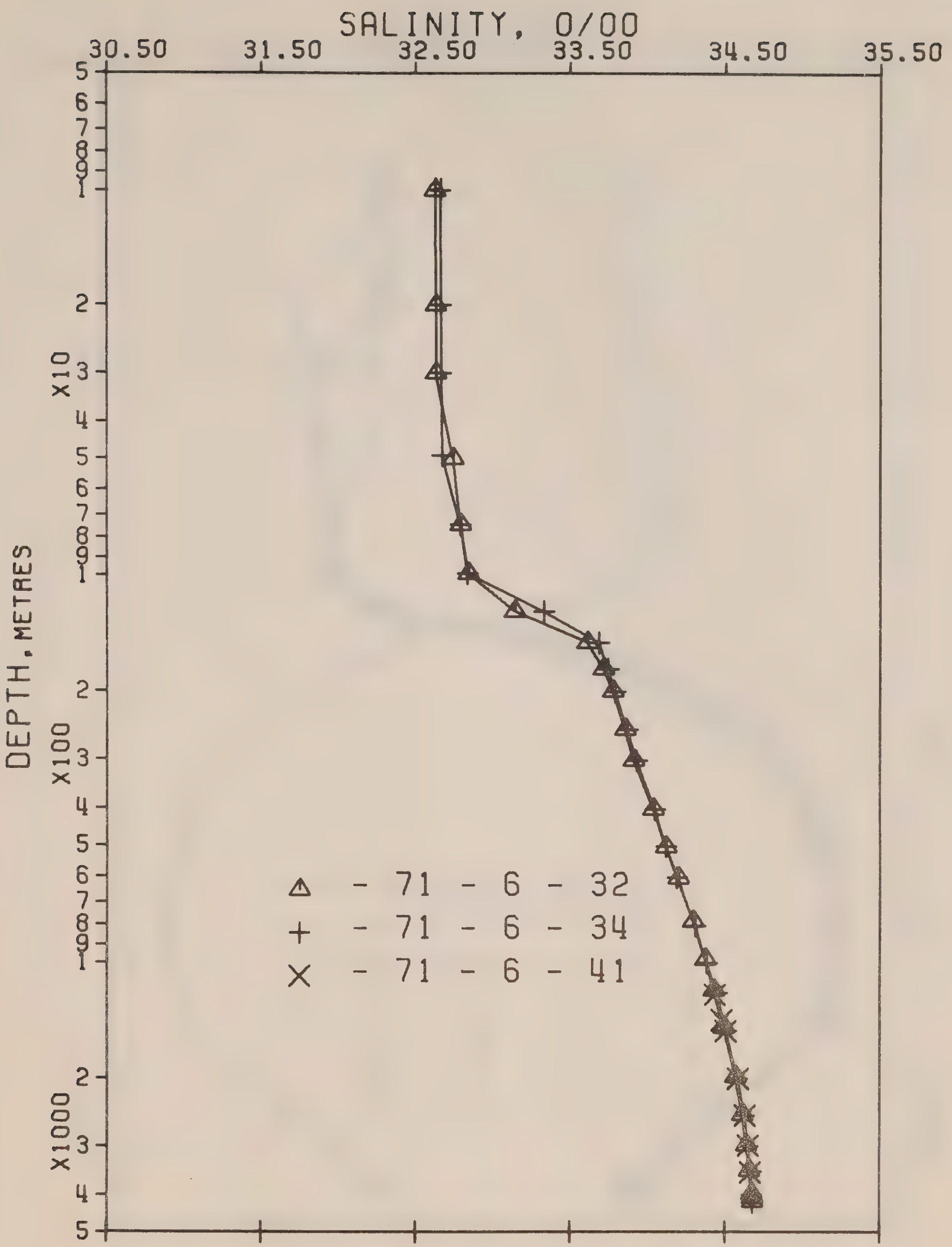


Fig. 6 Composite plot of salinity vs $\log_{10}$ depth P-71-6.

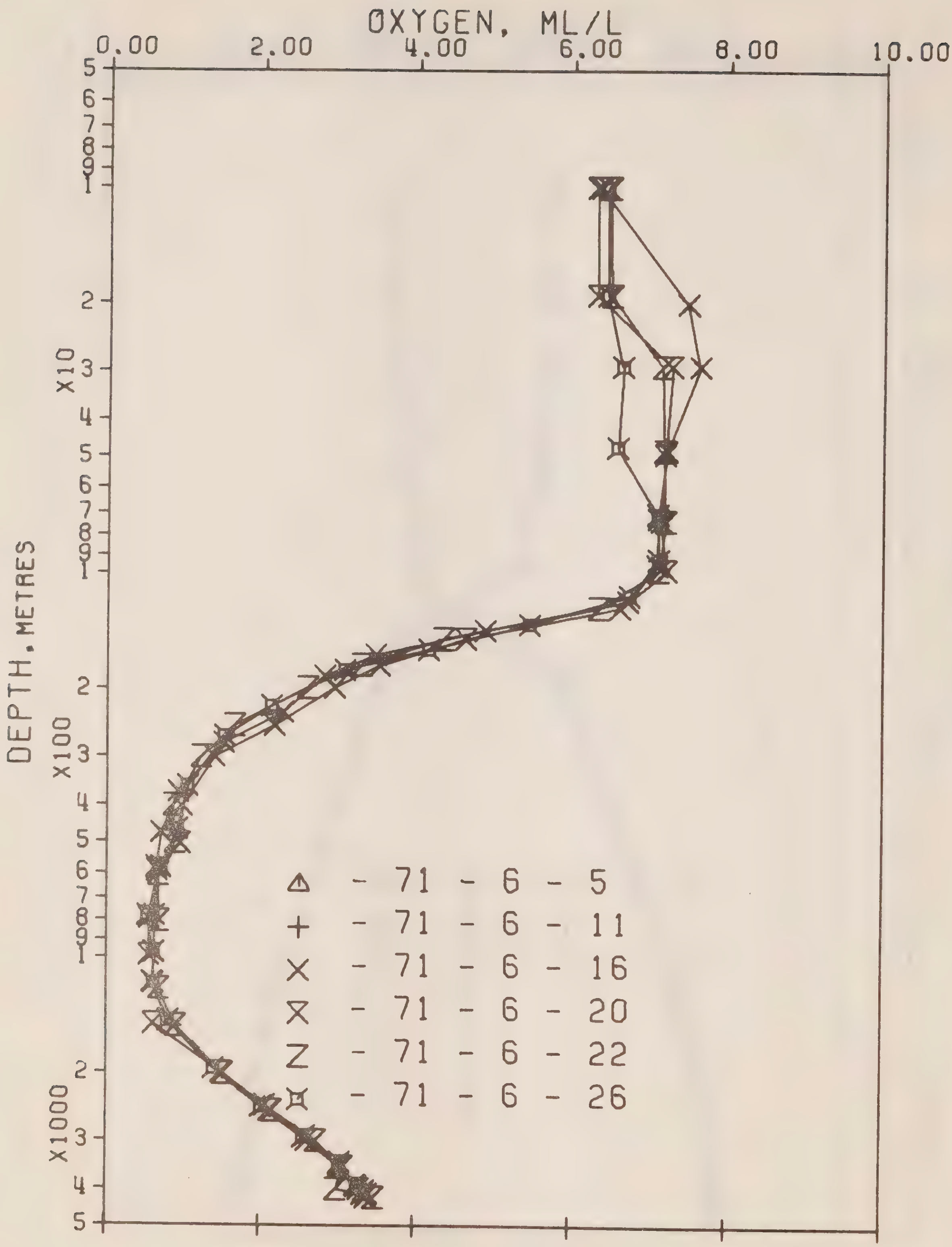


Fig. 7 Composite plot of oxygen vs $\log_{10}$ depth P-71-6.

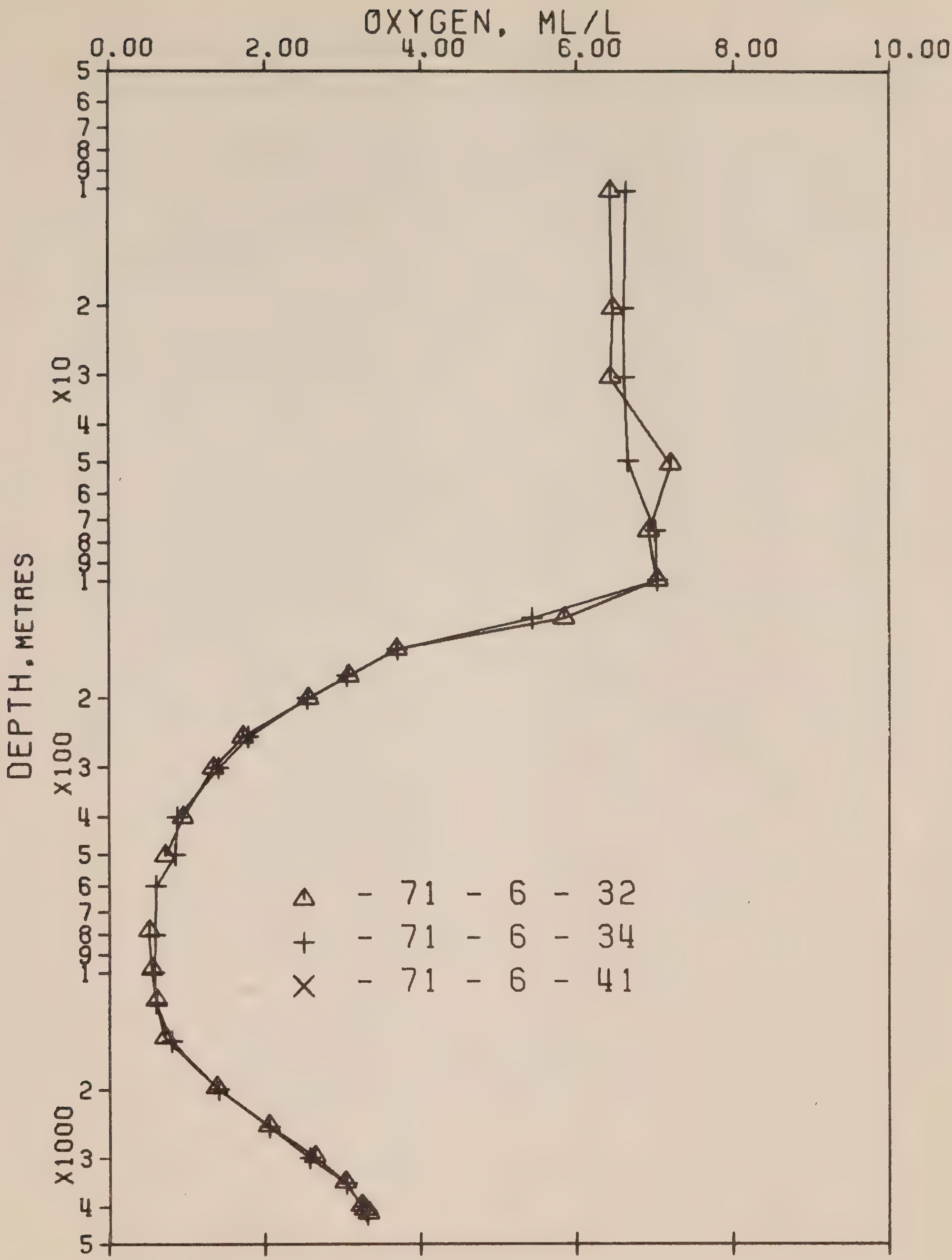
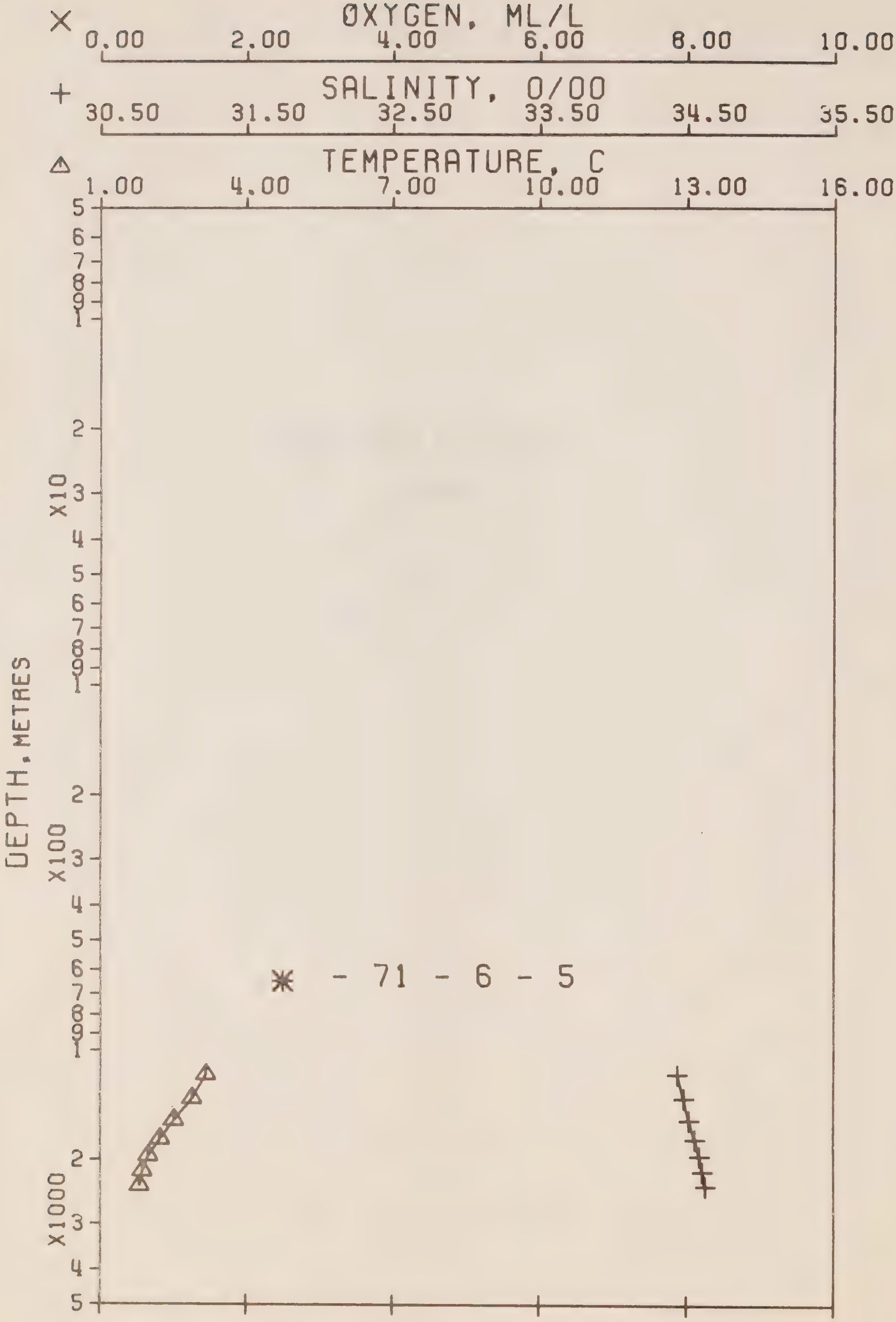


Fig. 8 Composite plot of oxygen vs $\log_{10}$ depth P-71-6.

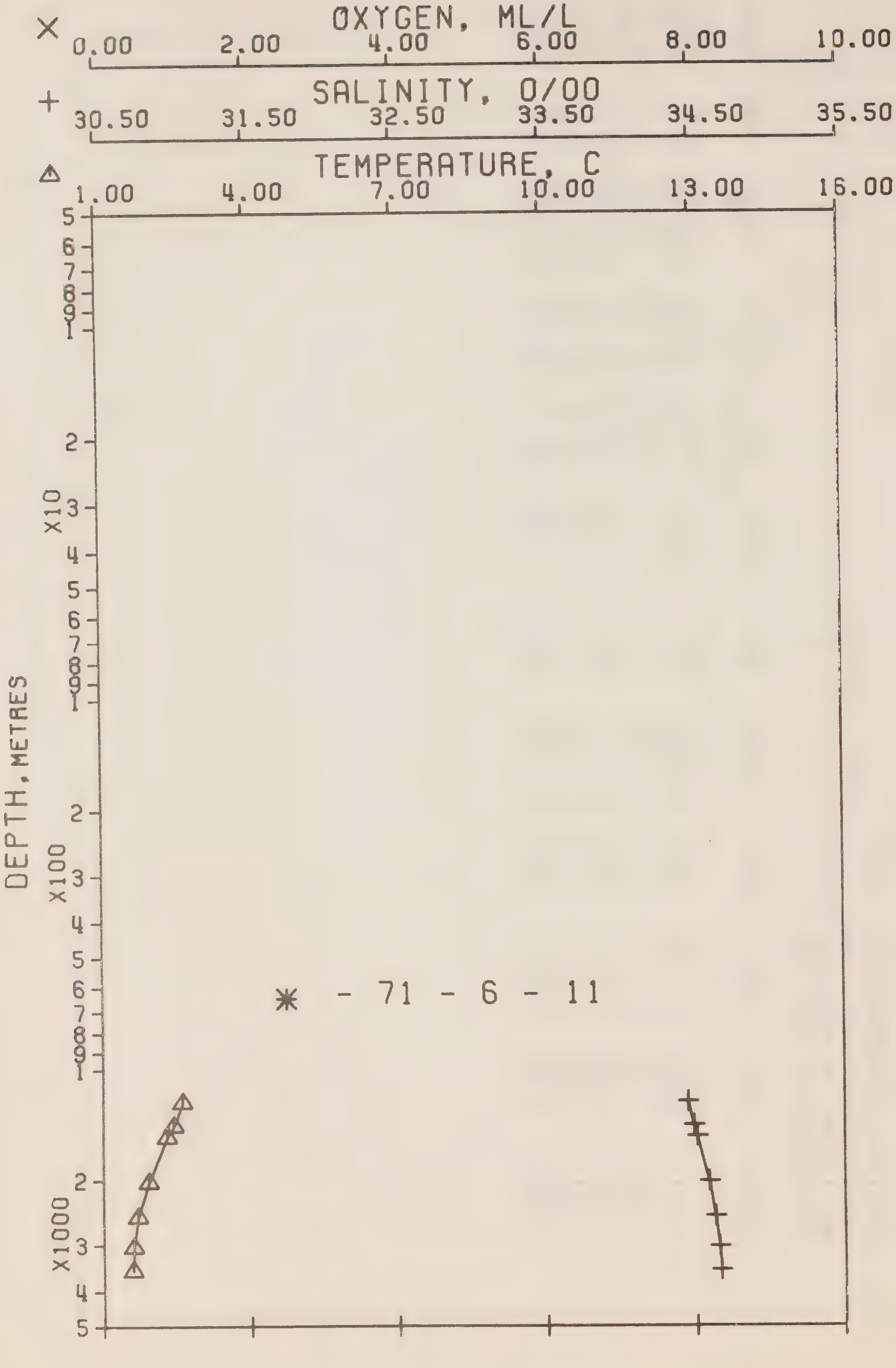
RESULTS OF BOTTLE CASTS

(P-71-6)


X OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 6 - 5

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 5 DATE 7/ 8/71
POSITION 48-46.0 N, 127-40.0 W GMT 8.7
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	16.99	31.945	0	23.200	468.5	16.99	468.3	0.0	0.0	0.0	1510.
1175	3.16	34.440	1165	27.448	72.7	3.08	63.5	28.88	54.65	0.0	1482.
1374	2.87	34.483	1361	27.509	67.3	2.77	57.6	30.25	72.73	0.0	1484.
1573	2.50	34.521	1558	27.572	61.3	2.39	51.7	31.53	92.03	0.0	1486.
1775	2.21	34.560	1756	27.627	56.0	2.09	46.4	32.71	112.12	0.0	1488.
1977	1.98	34.588	1955	27.668	52.1	1.84	42.5	33.80	132.96	0.0	1490.
2181	1.86	34.610	2156	27.695	49.8	1.71	39.8	34.84	154.98	0.0	1493.
2386	1.79	34.630	2357	27.716	48.2	1.62	37.7	35.84	178.30	0.0	1496.


OXYGEN, ML/L
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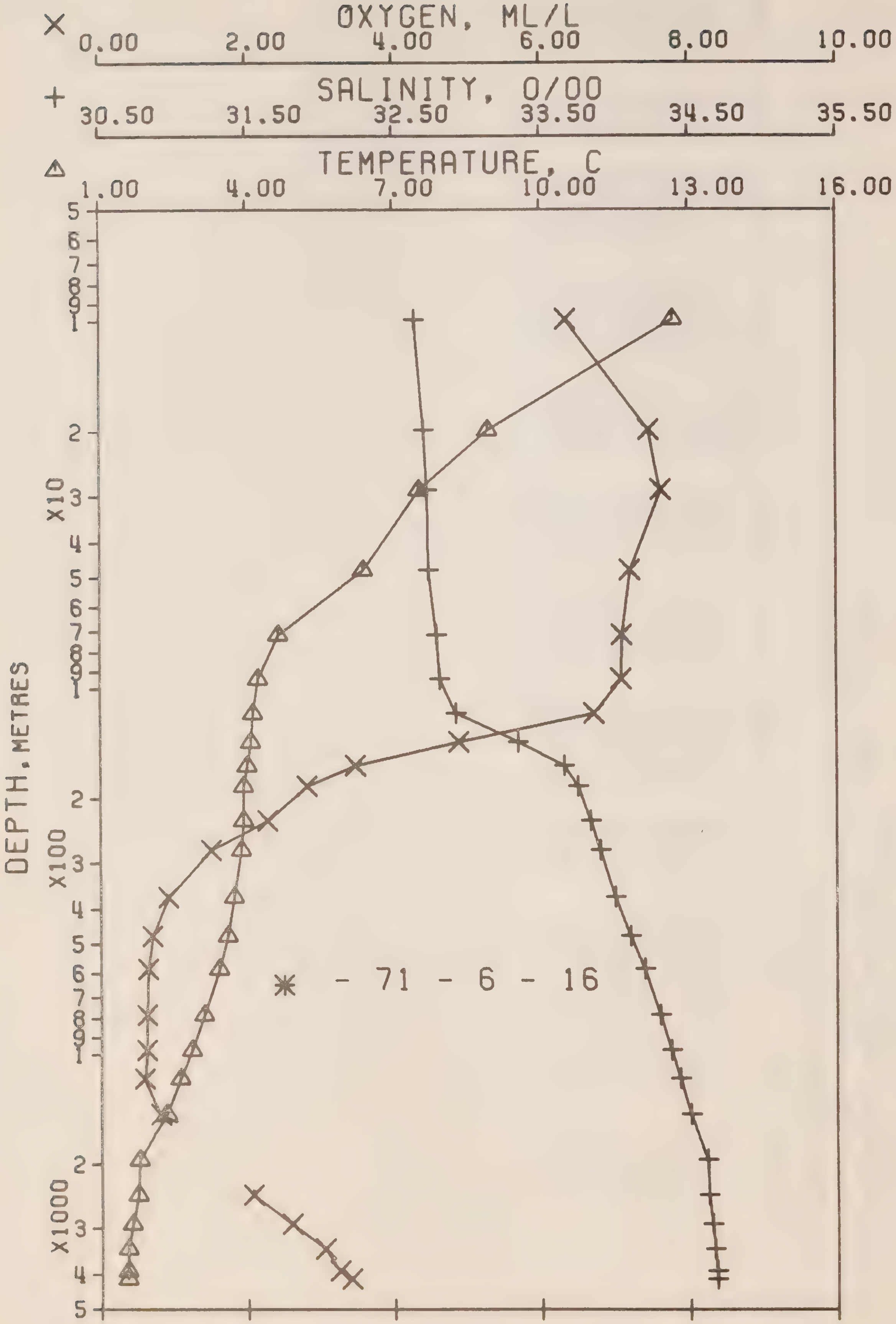
SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 6 - 11

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 11 DATE 8/ 8/71
POSITION 49-26.0 N, 136-40.0 W GMT 16.7
HYDROGRAPHIC CAST DATA

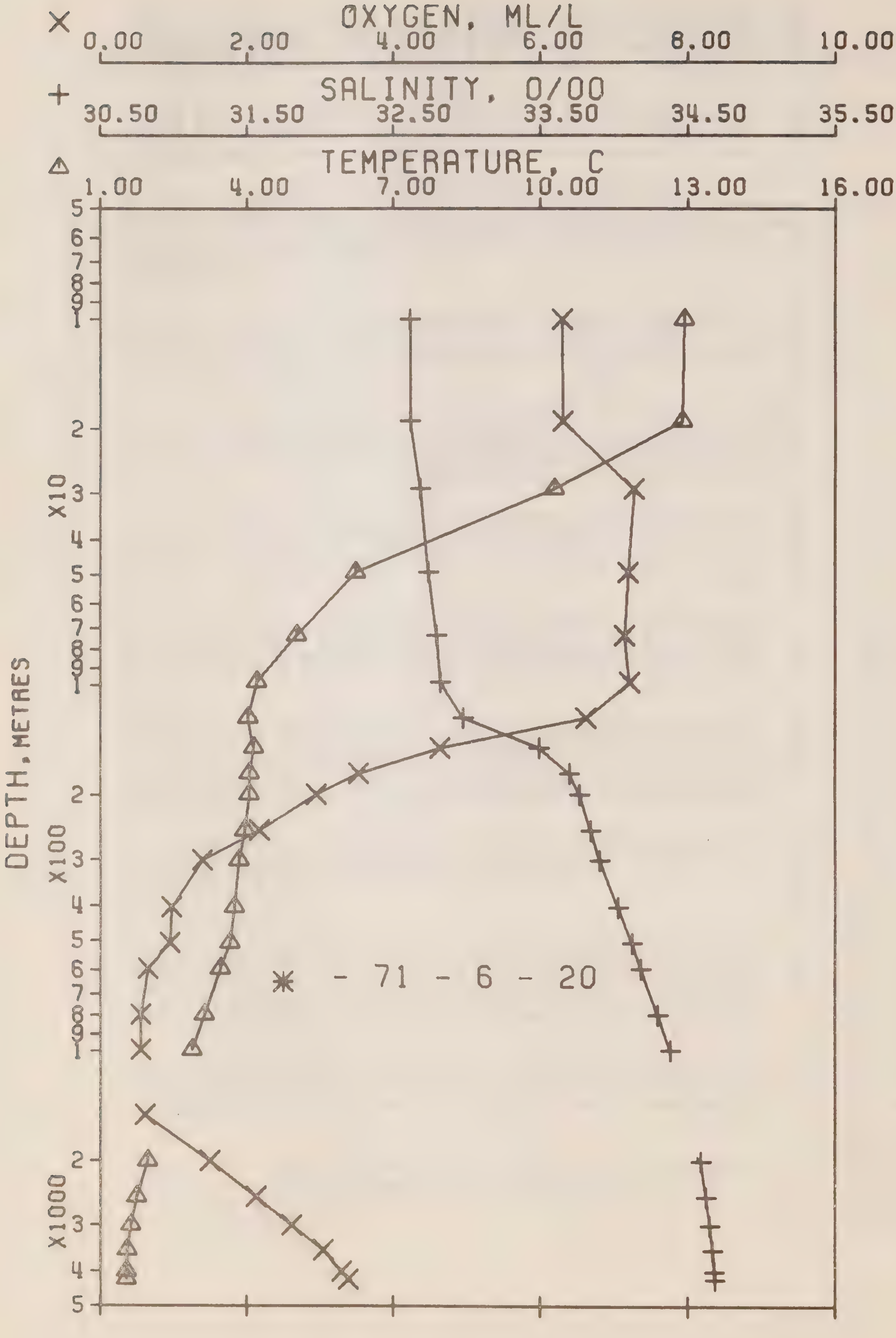
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	13.96	32.620	0	24.382	355.8	13.96	355.6	0.0	0.0	0.0	1501.
1245	2.61	34.450	1234	27.506	66.1	2.53	58.1	24.02	55.49	0.0	1481.
1446	2.42	34.491	1432	27.554	62.0	2.32	53.4	25.29	73.17	0.0	1483.
1547	2.29	34.511	1531	27.581	59.5	2.19	50.8	25.90	82.48	0.0	1484.
2048	1.91	34.592	2024	27.676	51.3	1.77	41.6	28.64	132.62	0.0	1491.
2555	1.69	34.632	2522	27.725	47.3	1.51	36.7	31.11	190.78	0.0	1499.
3079	1.60	34.656	3035	27.751	46.0	1.37	34.0	33.54	260.51	0.0	1507.
3585	1.58	34.667	3530	27.761	46.5	1.30	32.6	35.88	339.89	0.0	1516.



X OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
Δ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
5 6 7 8 9 1 2 3 4 5
* - 71 - 6 - 16

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 16 DATE 12/ 8/71
POSITION 50- 1.0 N, 144-56.0 W GMT 18.5
HYDROGRAPHIC CAST DATA

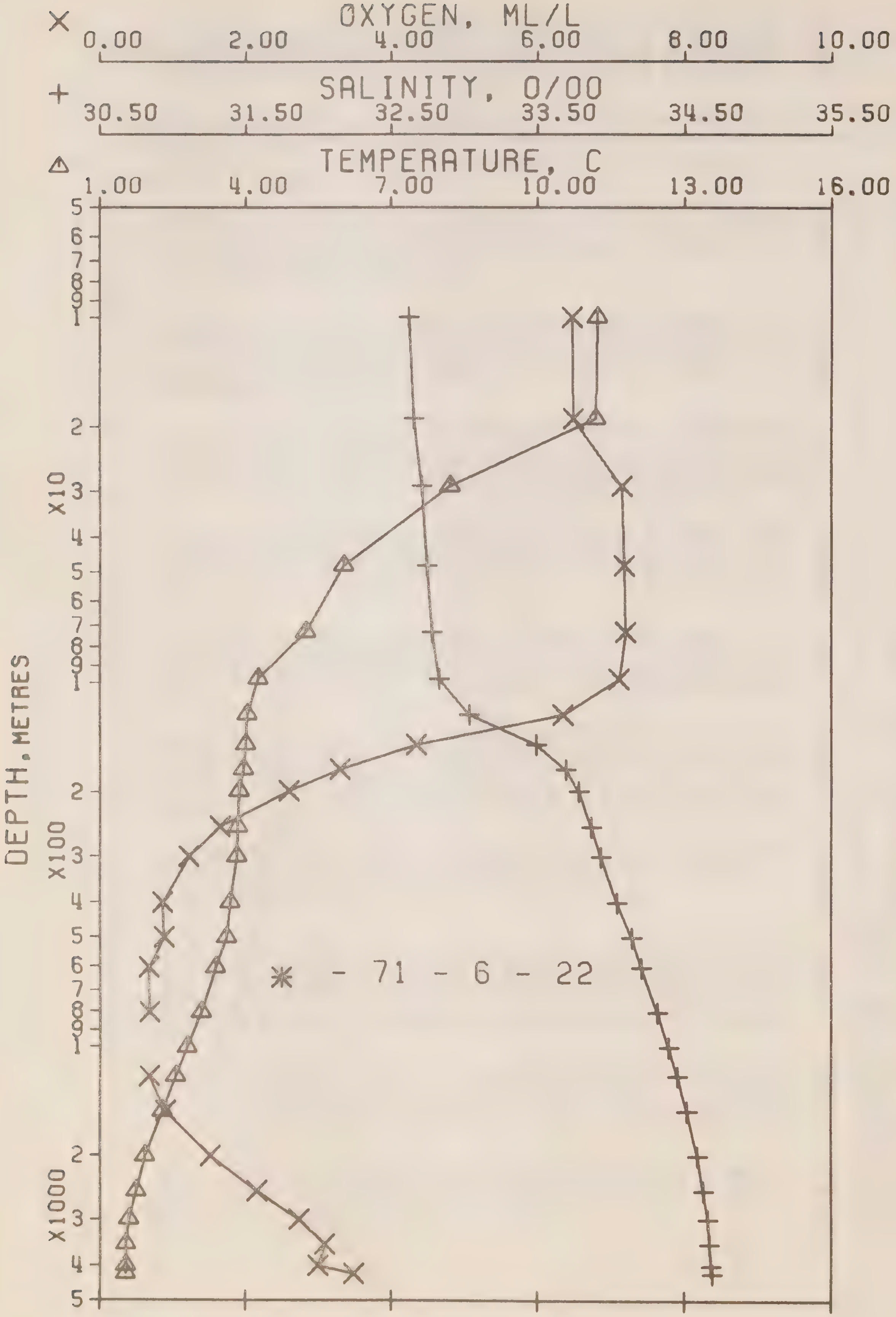
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	12.87	32.668	0	24.637	331.4	12.87	331.2	0.0	0.0	6.34	1498.
10	12.69	32.649	10	24.658	329.8	12.69	329.3	0.33	0.02	6.35	1497.
20	8.93	32.716	20	25.367	262.4	8.93	261.8	0.63	0.06	7.47	1484.
29	7.52	32.735	29	25.590	241.3	7.52	240.5	0.86	0.12	7.63	1479.
48	6.39	32.743	48	25.747	226.5	6.39	225.6	1.30	0.30	7.21	1474.
72	4.65	32.802	72	25.998	202.7	4.64	201.8	1.82	0.61	7.10	1468.
96	4.23	32.822	95	26.058	197.1	4.22	196.0	2.28	1.01	7.09	1466.
119	4.12	32.930	118	26.155	188.0	4.11	186.9	2.73	1.50	6.72	1467.
142	4.07	33.352	141	26.494	156.0	4.06	154.6	3.13	2.03	4.89	1467.
164	4.00	33.660	163	26.746	132.3	3.99	130.7	3.45	2.52	3.48	1468.
187	3.93	33.754	186	26.828	124.8	3.92	122.9	3.74	3.05	2.82	1468.
233	3.92	33.838	231	26.896	118.7	3.90	116.5	4.29	4.23	2.28	1469.
279	3.88	33.907	277	26.954	113.5	3.86	110.9	4.83	5.63	1.51	1469.
375	3.73	34.004	372	27.046	105.5	3.70	102.1	5.88	9.13	0.92	1470.
480	3.59	34.104	476	27.140	97.3	3.56	93.2	6.94	13.76	0.70	1472.
591	3.41	34.199	586	27.233	89.2	3.37	84.3	7.97	19.41	0.64	1473.
788	3.10	34.303	781	27.345	79.6	3.05	73.5	9.63	31.04	0.63	1475.
985	2.84	34.382	975	27.431	72.2	2.77	65.3	11.11	44.46	0.62	1477.
1181	2.61	34.439	1169	27.497	66.6	2.53	59.0	12.47	59.47	0.59	1480.
1476	2.32	34.509	1460	27.577	59.7	2.22	51.2	14.33	84.69	0.81	1483.
1969	1.76	34.620	1945	27.710	47.1	1.63	38.5	16.93	129.90	0.0	1489.
2465	1.74	34.626	2432	27.717	48.1	1.57	37.6	19.26	182.85	2.07	1497.
2966	1.61	34.650	2923	27.746	46.2	1.39	34.6	21.62	248.32	2.60	1505.
3473	1.53	34.666	3419	27.764	45.5	1.26	32.5	23.94	324.43	3.05	1514.
3988	1.53	34.681	3921	27.776	45.8	1.21	31.0	26.28	413.44	3.25	1523.
4197	1.52	34.681	4125	27.777	46.1	1.17	30.8	27.25	453.56	3.41	1526.



× OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 2 3 4 5
* - 71 - 6 - 20

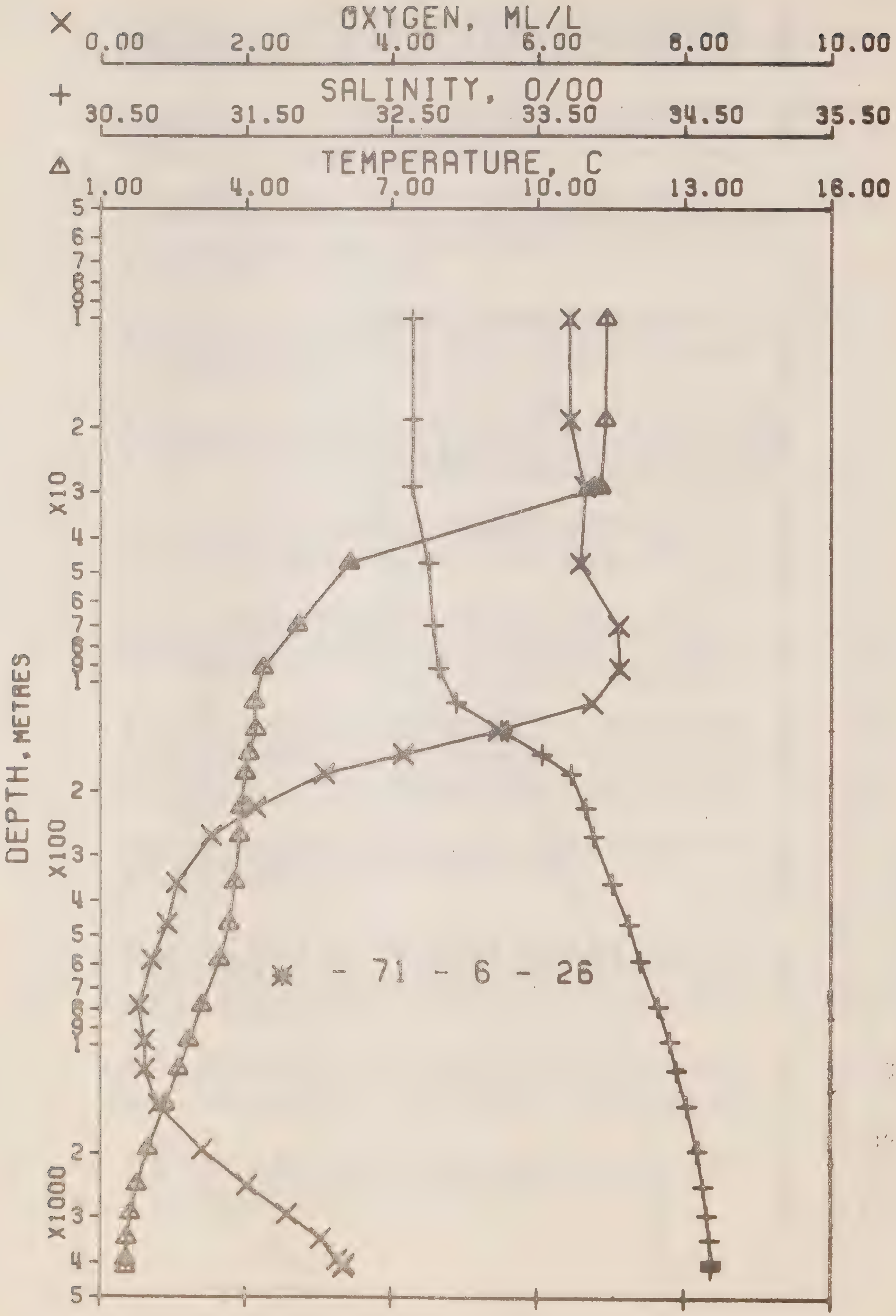
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 20 DATE 18/ 8/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 18.5
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	12.92	32.579	0	24.559	339.0	12.92	338.7	0.0	0.0	6.25	1498.
10	12.93	32.618	10	24.587	336.5	12.93	336.0	0.34	0.02	6.30	1498.
19	12.88	32.621	19	24.599	335.6	12.88	334.8	0.65	0.06	6.31	1498.
29	10.29	32.690	29	25.125	285.6	10.29	284.7	0.96	0.14	7.27	1489.
49	6.23	32.743	49	25.768	224.5	6.23	223.7	1.46	0.34	7.19	1474.
73	5.02	32.801	73	25.957	206.6	5.01	205.7	1.97	0.66	7.14	1469.
99	4.19	32.824	98	26.063	196.5	4.18	195.5	2.48	1.11	7.21	1466.
124	4.01	32.979	123	26.204	183.3	4.00	182.1	2.96	1.65	6.62	1466.
149	4.14	33.493	148	26.599	146.2	4.13	144.6	3.38	2.23	4.64	1468.
175	4.05	33.699	174	26.772	130.0	4.04	128.2	3.73	2.82	3.53	1468.
200	4.05	33.768	199	26.827	125.1	4.04	123.0	4.05	3.43	2.95	1469.
252	3.95	33.846	250	26.899	118.6	3.93	116.1	4.68	4.87	2.17	1469.
303	3.84	33.903	301	26.955	113.6	3.82	110.8	5.27	6.56	1.39	1470.
407	3.75	34.030	404	27.065	104.0	3.72	100.3	6.40	10.65	0.97	1471.
511	3.65	34.125	507	27.151	96.7	3.61	92.1	7.45	15.53	0.95	1473.
601	3.46	34.187	596	27.218	90.7	3.42	85.7	8.29	20.30	0.65	1473.
802	3.13	34.298	795	27.338	80.4	3.08	74.2	10.00	32.55	0.55	1475.
1005	2.87	34.386	995	27.432	72.3	2.80	65.2	11.54	46.73	0.55	1478.
1207	2.64*	34.450*	1195	27.503	66.2	2.55	58.4	12.94	62.50	0.0	1480.
1512	2.34*	34.519*	1495	27.584	59.3	2.23	50.6	14.84	88.83	0.61	1484.
2023	1.96	34.590	1998	27.671	51.9	1.82	42.1	17.65	139.50	1.50	1491.
2535	1.74	34.627	2501	27.718	48.3	1.56	37.4	20.20	198.77	2.13	1499.
3050	1.61	34.652	3005	27.747	46.3	1.38	34.3	22.63	267.83	2.62	1507.
3566	1.54	34.671	3510	27.768	45.5	1.26	32.1	24.99	347.48	3.05	1515.
4083	1.53	34.679	4014	27.775	46.2	1.20	31.1	27.35	439.68	3.30	1524.
4290	1.53	34.683	4216	27.778	46.4	1.17	30.6	28.31	480.65	3.39	1528.


OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, O/OO
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 6 - 22

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 22   DATE 25/ 8/71
POSITION 50- 0.0 N, 144-55.0 W   GMT 18.2
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	11.22	32.650	0	24.932	303.4	11.22	303.1	0.0	0.0	6.42	1492.
10	11.21	32.625	10	24.915	305.3	11.21	304.8	0.31	0.02	6.47	1492.
19	11.19	32.659	19	24.944	302.6	11.19	302.0	0.58	0.06	6.49	1492.
29	8.22	32.716	29	25.474	252.3	8.22	251.5	0.86	0.13	7.15	1481.
48	6.03	32.748	48	25.796	221.7	6.03	221.0	1.31	0.30	7.18	1473.
73	5.24	32.784	73	25.919	210.3	5.23	209.3	1.84	0.64	7.20	1470.
99	4.26	32.834	98	26.064	196.5	4.25	195.4	2.36	1.09	7.11	1467.
124	4.03	33.040	123	26.251	178.9	4.02	177.8	2.83	1.63	6.35	1466.
149	4.00	33.495	148	26.615	144.7	3.99	143.1	3.24	2.19	4.35	1467.
174	3.95	33.694	173	26.778	129.4	3.94	127.6	3.58	2.75	3.30	1468.
200	3.86	33.785	199	26.859	121.8	3.85	119.9	3.91	3.38	2.60	1468.
252	3.84	33.868	250	26.927	115.8	3.82	113.4	4.52	4.78	1.65	1469.
303	3.82	33.936	301	26.983	110.9	3.80	108.1	5.10	6.43	1.22	1470.
406	3.69	34.046	403	27.084	102.2	3.66	98.5	6.19	10.39	0.86	1471.
506	3.61	34.143	502	27.169	94.9	3.57	90.4	7.18	14.96	0.88	1472.
612	3.39	34.212	607	27.245	88.2	3.35	83.1	8.15	20.49	0.67	1473.
815	3.09	34.319	808	27.358	78.4	3.03	72.3	9.83	32.75	0.68	1475.
1018	2.79	34.394	1008	27.445	70.9	2.72	64.0	11.34	46.84	0.0	1478.
1221	2.55	34.456	1208	27.516	64.8	2.47	57.2	12.71	62.48	0.68	1480.
1524	2.28	34.520	1507	27.589	58.6	2.18	50.1	14.57	88.55	0.90	1484.
2030	1.92	34.590	2005	27.674	51.4	1.78	41.8	17.33	138.54	1.52	1491.
2536	1.73	34.630	2502	27.721	47.9	1.55	37.1	19.83	196.75	2.16	1499.
3046	1.59	34.658	3001	27.754	45.7	1.36	33.8	22.21	264.23	2.74	1507.
3559	1.53	34.670	3503	27.768	45.4	1.25	32.2	24.53	342.63	3.09	1515.
4079	1.53	34.682	4010	27.777	45.9	1.20	30.8	26.91	435.03	3.00	1524.
4288	1.53	34.690	4214	27.784	45.9	1.17	30.1	27.87	476.04	3.49	1528.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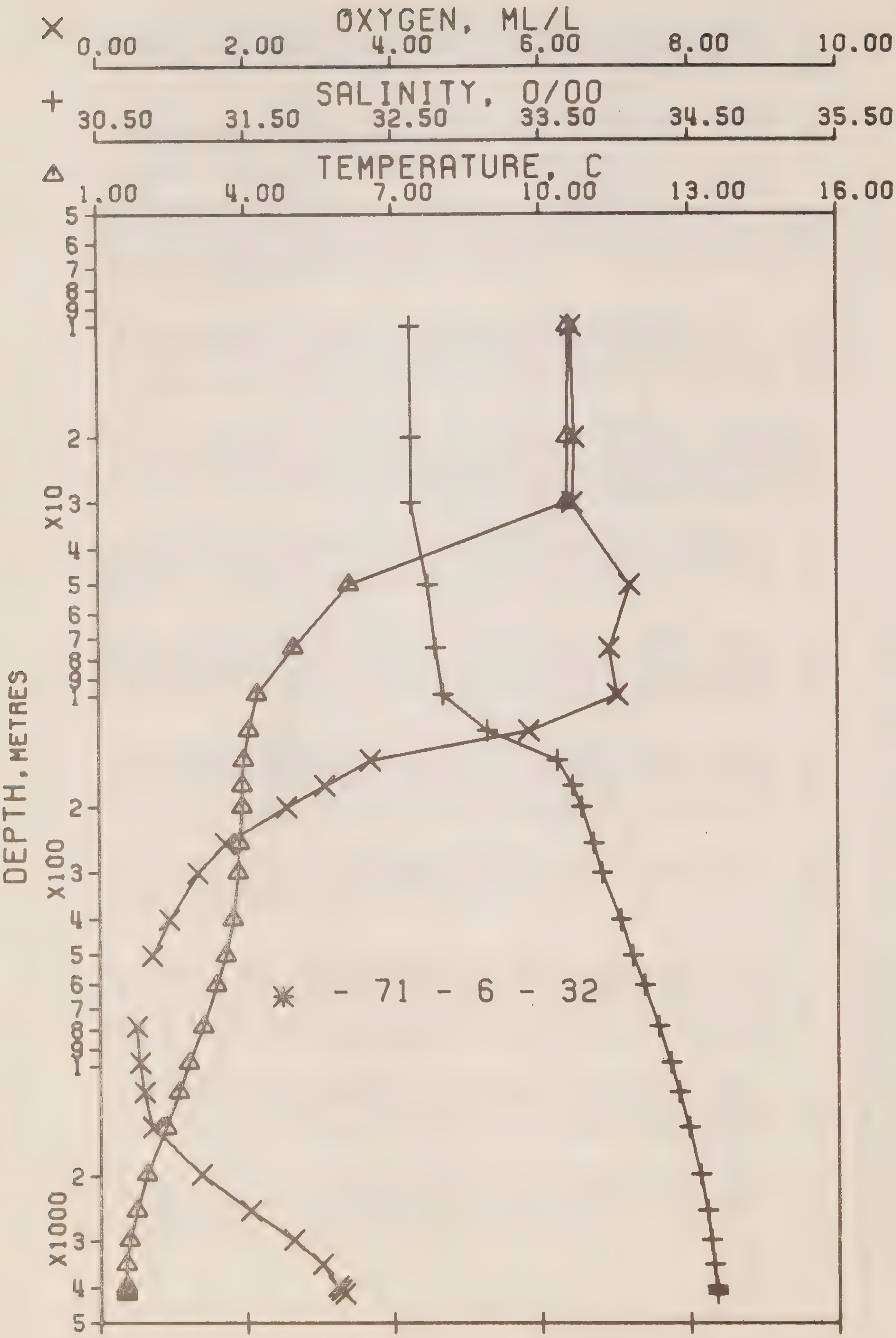
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
- 71 - 6 - 26

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 26 DATE 30/ 8/71
POSITION 50- 2.0 N, 144-56.0 W GMT 18.4
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	11.43	32.647	0	24.892	307.2	11.43	307.0	0.0	0.0	6.44	1493.
10	11.39	32.646	10	24.898	306.8	11.39	306.3	0.31	0.02	6.43	1493.
19	11.38	32.645	19	24.900	306.9	11.38	306.2	0.59	0.06	6.44	1493.
29	11.28	32.642	29	24.915	305.6	11.28	304.7	0.90	0.13	6.64	1492.
47	6.13	32.755	47	25.789	222.4	6.13	221.6	1.38	0.32	6.58	1473.
70	5.06	32.792	70	25.945	207.7	5.05	206.7	1.86	0.61	7.10	1469.
93	4.34	32.824	92	26.048	198.0	4.33	196.9	2.31	0.98	7.11	1467.
115	4.16	32.943	114	26.161	187.4	4.15	186.3	2.74	1.44	6.74	1467.
137	4.19	33.255	136	26.405	164.5	4.18	163.1	3.13	1.94	5.46	1468.
159	4.06	33.530	158	26.637	142.7	4.05	141.1	3.47	2.45	4.16	1468.
180	3.98	33.731	179	26.804	126.9	3.97	125.2	3.75	2.94	3.08	1468.
224	3.90	33.831	222	26.892	119.0	3.88	116.8	4.28	4.02	2.13	1469.
268	3.87	33.885	266	26.938	115.0	3.85	112.4	4.80	5.32	1.52	1469.
362	3.76	34.009	359	27.047	105.3	3.73	102.0	5.83	8.63	1.04	1470.
469	3.64	34.123	465	27.150	96.4	3.61	92.2	6.90	13.19	0.91	1472.
590	3.44	34.201	585	27.231	89.4	3.40	84.4	8.03	19.26	0.70	1473.
787	3.09	34.323	780	27.361	78.0	3.04	72.0	9.67	30.79	0.53	1475.
986	2.81	34.405	976	27.452	70.2	2.74	63.3	11.13	43.99	0.61	1477.
1184	2.61	34.450	1172	27.506	65.8	2.53	58.2	12.48	58.88	0.61	1480.
1482	2.32	34.519	1466	27.585	58.9	2.22	50.5	14.34	84.08	0.80	1483.
1982	1.97	34.588	1958	27.669	52.0	1.83	42.4	17.08	132.59	1.40	1490.
2485	1.75	34.630	2452	27.719	48.0	1.57	37.3	19.58	189.57	2.02	1498.
2991	1.61	34.656	2948	27.750	45.9	1.39	34.1	21.95	255.68	2.57	1506.
3500	1.54	34.676	3445	27.772	44.9	1.27	31.8	24.25	331.80	3.04	1514.
4010	1.52	34.686	3943	27.781	45.3	1.20	30.6	26.55	419.63	3.27	1523.
4113	1.52*	34.686	4043	27.781	45.6	1.18	30.5	27.01	438.93	3.37	1525.
4215	1.52	34.682	4143	27.778	46.1	1.17	30.7	27.48	458.90	3.35	1526.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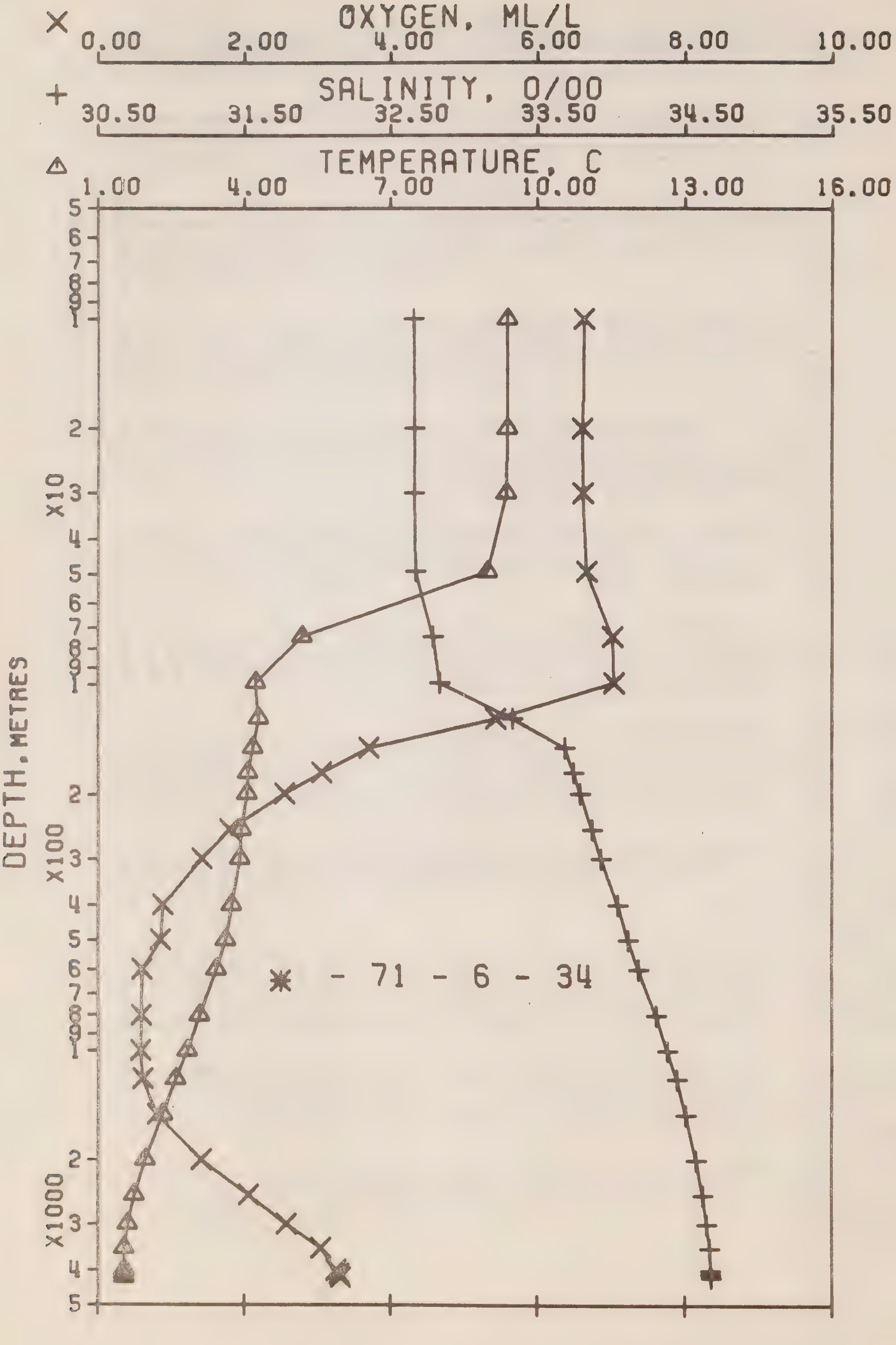
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
✳ - 71 - 6 - 32

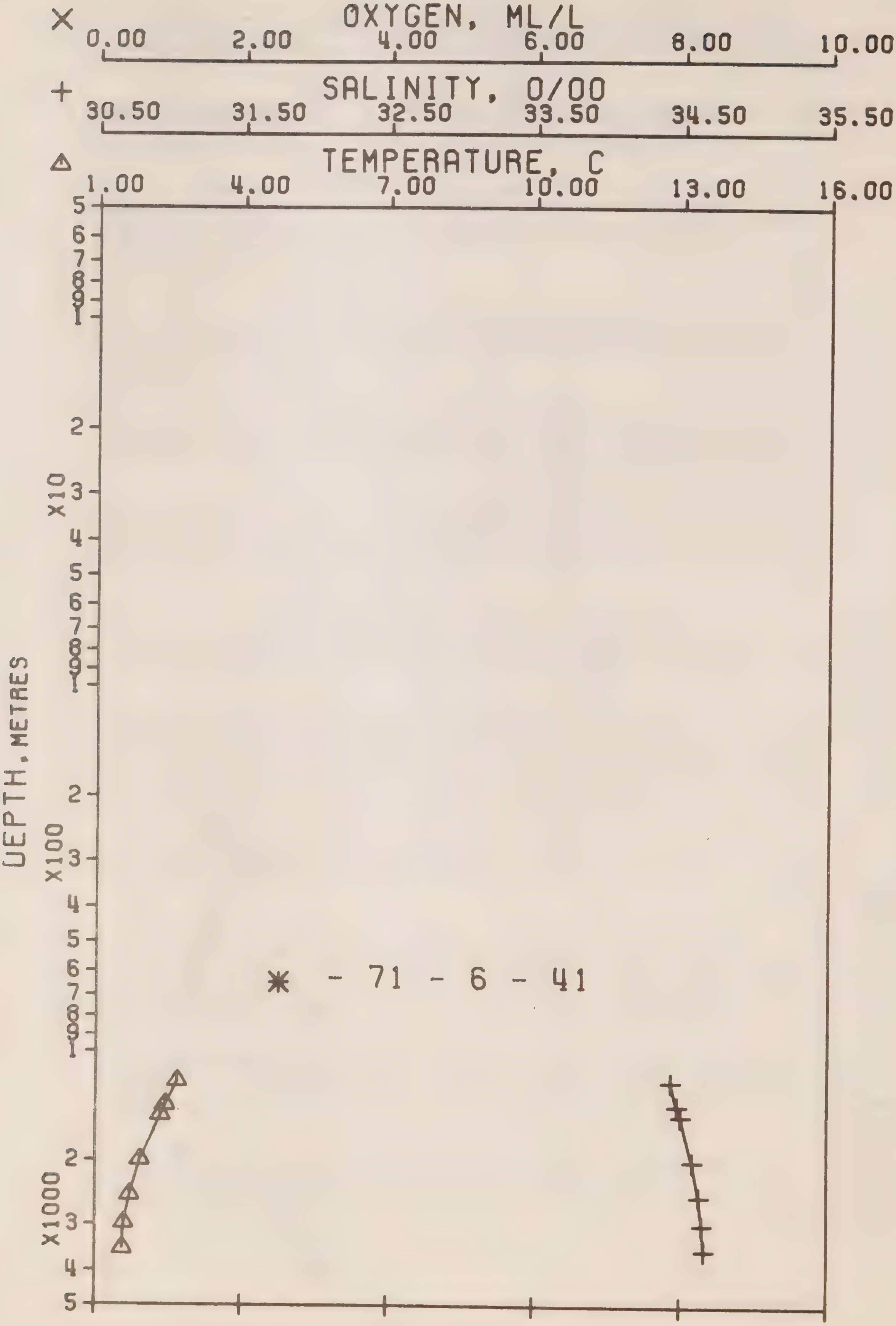
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 32 DATE 9/ 9/71
POSITION 50- 5.0 N, 145- 0.0 W GMT 18.3
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	10.56	32.632	0	25.034	293.6	10.56	293.4	0.0	0.0	6.46	1489.
10	10.57	32.627	10	25.028	294.4	10.57	294.0	0.30	0.02	6.43	1490.
20	10.56	32.628	20	25.031	294.4	10.56	293.7	0.59	0.06	6.47	1490.
30	10.54	32.632	30	25.038	294.0	10.54	293.1	0.89	0.14	6.44	1490.
50	6.11	32.744	50	25.783	223.0	6.11	222.1	1.41	0.35	7.21	1473.
74	4.97	32.793	74	25.956	206.7	4.96	205.7	1.92	0.67	6.93	1469.
100	4.23	32.843	99	26.074	195.6	4.22	194.5	2.43	1.13	7.04	1467.
125	4.06	33.143	124	26.330	171.5	4.05	170.2	2.90	1.66	5.85	1467.
150	3.96	33.614	149	26.714	135.3	3.95	133.8	3.28	2.19	3.70	1467.
175	3.92	33.721	174	26.803	127.1	3.91	125.4	3.60	2.73	3.08	1468.
200	3.92	33.781	199	26.850	122.7	3.91	120.7	3.92	3.34	2.56	1468.
252	3.86	33.858	250	26.917	116.8	3.84	114.4	4.53	4.75	1.72	1469.
302	3.83	33.914	300	26.965	112.7	3.81	109.8	5.11	6.39	1.34	1470.
404	3.73	34.039	401	27.074	103.1	3.70	99.4	6.21	10.34	0.95	1471.
506	3.58	34.122	502	27.155	96.1	3.54	91.7	7.22	15.05	0.72	1472.
608	3.39	34.201	603	27.236	89.0	3.35	83.9	8.17	20.40	0.0	1473.
789	3.12	34.295	782	27.336	80.4	3.07	74.4	9.69	31.27	0.51	1475.
988	2.82	34.373	978	27.426	72.7	2.75	65.8	11.21	44.96	0.55	1477.
1188	2.61	34.431	1176	27.490	67.2	2.53	59.6	12.60	60.48	0.61	1480.
1488	2.33	34.496	1472	27.566	60.8	2.23	52.3	14.52	86.59	0.72	1484.
1993	1.95	34.570	1969	27.656	53.1	1.81	43.6	17.37	137.16	1.38	1490.
2500	1.73	34.615	2467	27.709	48.9	1.55	38.3	19.94	196.05	2.05	1498.
3009	1.59	34.642	2965	27.741	46.6	1.37	35.0	22.36	263.93	2.64	1506.
3520	1.53	34.658	3465	27.758	46.1	1.26	33.1	24.72	342.61	3.03	1515.
4032	1.52	34.673	3964	27.771	46.3	1.19	31.6	27.09	433.68	3.24	1523.
4134	1.52	34.679	4064	27.775	46.1	1.18	31.0	27.56	453.42	3.28	1525.
4236	1.52	34.679	4163	27.775	46.4	1.17	30.9	28.03	473.47	3.33	1527.


X OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
+ SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
△ TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 6 - 34

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 34 DATE 13/ 9/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 18.0
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	9.40	32.661	0	25.249	273.2	9.40	273.0	0.0	0.0	6.24	1485.
10	9.38	32.662	10	25.253	273.0	9.38	272.6	0.27	0.01	6.63	1485.
20	9.38	32.663	20	25.254	273.1	9.38	272.5	0.55	0.06	6.61	1485.
30	9.37	32.665	30	25.257	273.0	9.37	272.2	0.82	0.13	6.62	1486.
49	8.98	32.675	49	25.327	266.6	8.97	265.6	1.34	0.34	6.67	1484.
74	5.18	32.793	74	25.932	208.9	5.17	208.0	1.94	0.71	7.02	1470.
100	4.22	32.840	99	26.073	195.7	4.21	194.6	2.45	1.16	7.04	1467.
125	4.28	33.334	124	26.459	159.4	4.27	158.0	2.90	1.68	5.44	1468.
150	4.17	33.692	149	26.754	131.5	4.16	130.0	3.26	2.18	3.71	1468.
175	4.06	33.751	174	26.812	126.2	4.05	124.4	3.58	2.72	3.06	1468.
200	4.05	33.797	199	26.850	122.9	4.04	120.8	3.90	3.32	2.55	1469.
251	3.92	33.873	249	26.923	116.2	3.90	113.9	4.50	4.70	1.79	1469.
302	3.89	33.936	300	26.976	111.7	3.87	108.7	5.08	6.35	1.41	1470.
403	3.73	34.048	400	27.081	102.4	3.70	98.8	6.16	10.23	0.88	1471.
504	3.61	34.121	500	27.151	96.5	3.57	92.1	7.16	14.87	0.85	1472.
605	3.42	34.190	600	27.225	90.1	3.38	85.0	8.11	20.19	0.60	1473.
809	3.07	34.310	802	27.353	78.9	3.01	72.8	9.82	32.56	0.59	1475.
1012	2.81	34.386	1002	27.437	71.7	2.74	64.7	11.34	46.67	0.58	1478.
1214	2.57	34.449	1202	27.508	65.6	2.49	57.9	12.73	62.41	0.61	1480.
1518	2.30	34.509	1501	27.579	59.7	2.20	51.1	14.62	88.72	0.81	1484.
2025	1.96	34.582	2000	27.665	52.5	1.82	42.7	17.44	139.68	1.41	1491.
2533	1.74	34.626	2499	27.717	48.3	1.56	37.5	19.99	198.80	2.06	1499.
3043	1.60	34.648	2999	27.745	46.5	1.37	34.6	22.40	267.30	2.58	1507.
3555	1.53	34.668	3499	27.766	45.5	1.25	32.3	24.74	346.12	3.05	1515.
4071	1.53	34.675	4002	27.772	46.4	1.20	31.4	27.11	438.35	3.26	1524.
4174	1.52	34.677	4103	27.774	46.3	1.18	31.1	27.59	458.54	3.30	1526.
4278	1.53	34.678	4204	27.774	46.7	1.17	31.0	28.07	479.31	3.32	1528.



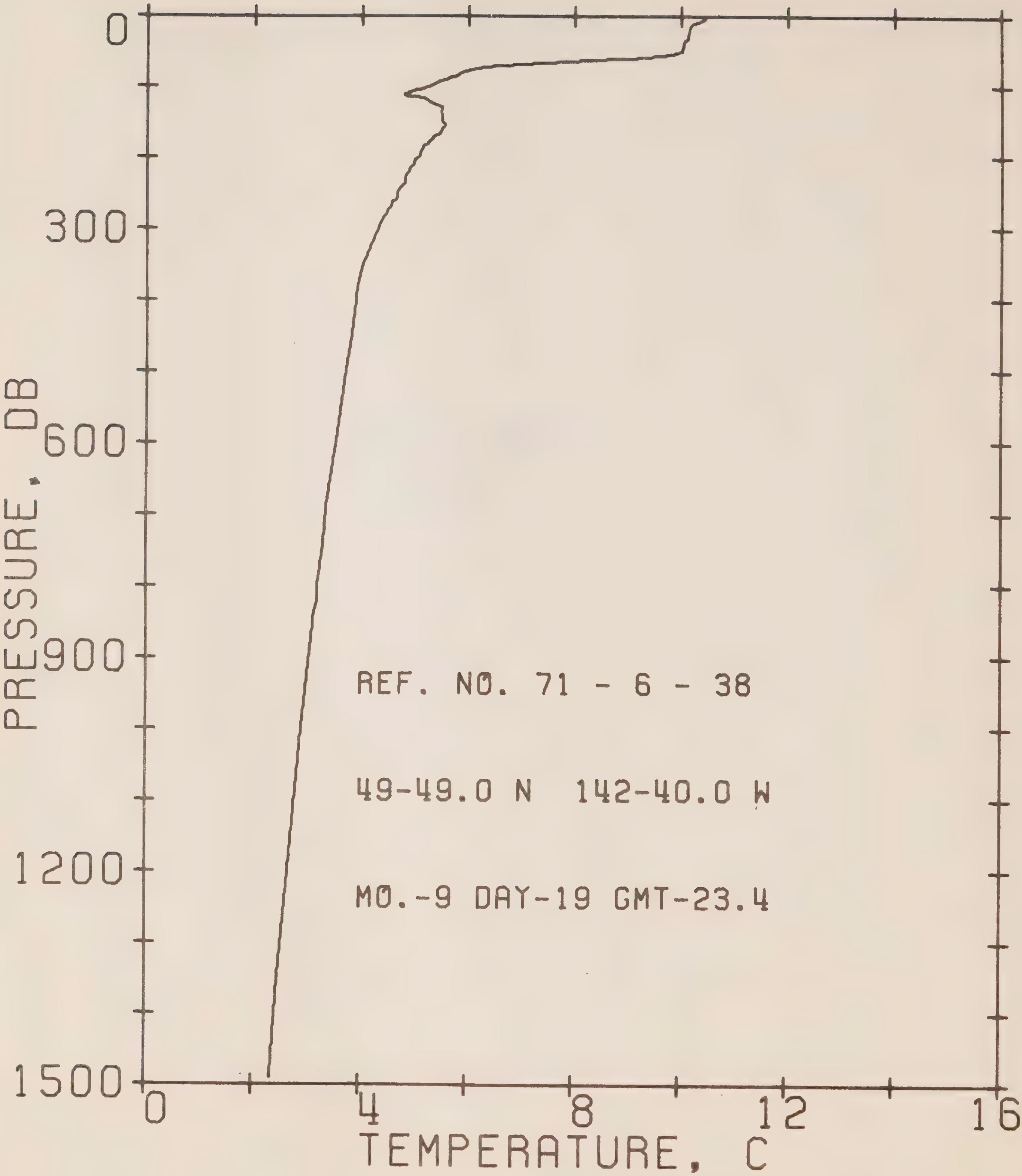
OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 6 - 41

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 6- 41 DATE 20/ 9/71
POSITION 49-26.0 N, 136-40.0 W GMT 18.8
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	12.26	32.613	0	24.712	324.3	12.26	324.1	0.0	0.0	0.0	1495.
1219	2.66	34.434	1208	27.488	67.7	2.58	59.7	22.02	55.07	0.0	1480.
1420	2.43	34.482	1406	27.546	62.6	2.33	54.2	23.32	72.66	0.0	1483.
1520	2.33	34.504	1504	27.572	60.4	2.23	51.7	23.93	81.82	0.0	1484.
2021	1.92	34.584	1997	27.669	51.8	1.78	42.3	26.71	131.97	0.0	1491.
2525	1.70	34.628	2492	27.721	47.7	1.52	37.1	29.20	189.60	0.0	1498.
3035	1.59	34.649	2992	27.746	46.2	1.37	34.4	31.58	257.20	0.0	1507.
3556	1.55	34.665	3501	27.762	46.0	1.27	32.6	33.98	337.76	0.0	1515.

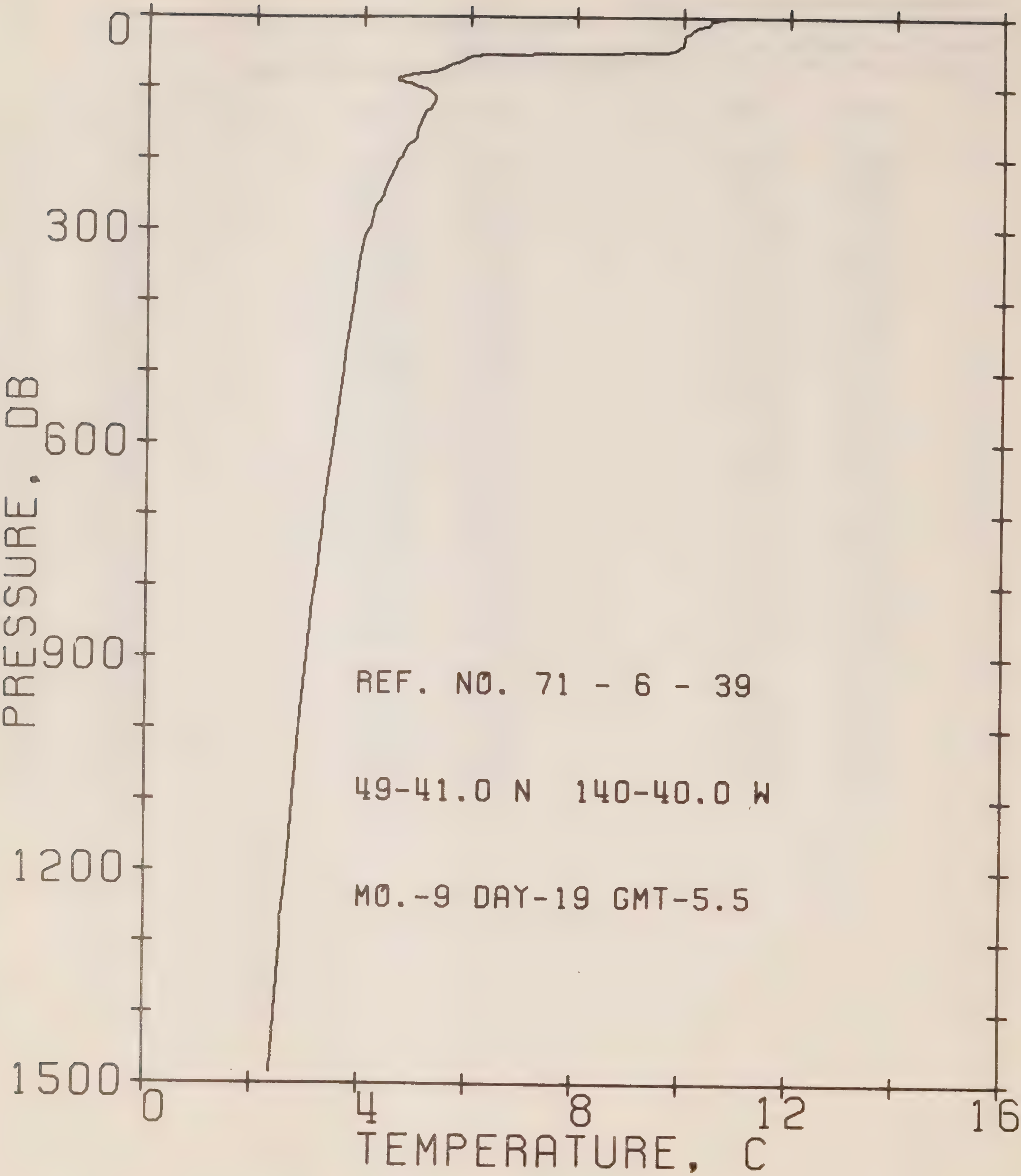
RESULTS OF STD CASTS

(P-71-6)


0
300
600
900
1200
1500
PRESSURE, DB
0
4
8
12
16
TEMPERATURE, C
REF. NO. 71 - 6 - 38
49-49.0 N 142-40.0 W
MO.-9 DAY-19 GMT-23.4

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-038 DATE 19/09/71
POSITION 49-04.9N 142-04.0W GMT 23.4
RESULTS OF STP CAST 90 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	10.42	0104	05.12	0207	04.98
0004	10.42	0105	05.04	0210	04.98
0005	10.45	0109	04.90	0217	04.92
0010	10.25	0110	04.80	0220	04.90
0014	10.18	0112	04.80	0224	04.86
0020	10.16	0114	04.89	0232	04.84
0030	10.13	0115	05.03	0233	04.82
0032	10.12	0118	05.22	0236	04.82
0035	10.07	0121	05.25	0245	04.73
0050	10.02	0125	05.42	0258	04.66
0051	10.01	0126	05.45	0262	04.60
0054	09.83	0130	05.51	0267	04.59
0058	09.35	0138	05.50	0289	04.40
0060	08.99	0144	05.52	0298	04.35
0063	08.22	0149	05.51	0350	04.05
0064	07.95	0150	05.53	0380	03.96
0066	07.40	0155	05.58	0400	03.93
0068	07.00	0157	05.58	0450	03.85
0072	06.30	0160	05.53	0500	03.74
0074	06.19	0166	05.50	0600	03.54
0075	06.04	0171	05.37	0690	03.37
0080	05.87	0175	05.31	0743	03.31
0086	05.75	0179	05.26	0800	03.20
0087	05.67	0181	05.26	0820	03.19
0089	05.65	0183	05.21	0846	03.12
0094	05.42	0188	05.16	0855	03.13
0097	05.40	0194	05.13	1000	02.92
0098	05.30	0200	05.07	1200	02.67
0100	05.26	0203	05.02	1350	02.49
0102	05.16	0206	05.02	1490	02.35


REF. NO. 71 - 6 - 39
49-41.0 N 140-40.0 W
MO.-9 DAY-19 GMT-5.5
PRESSURE, DB
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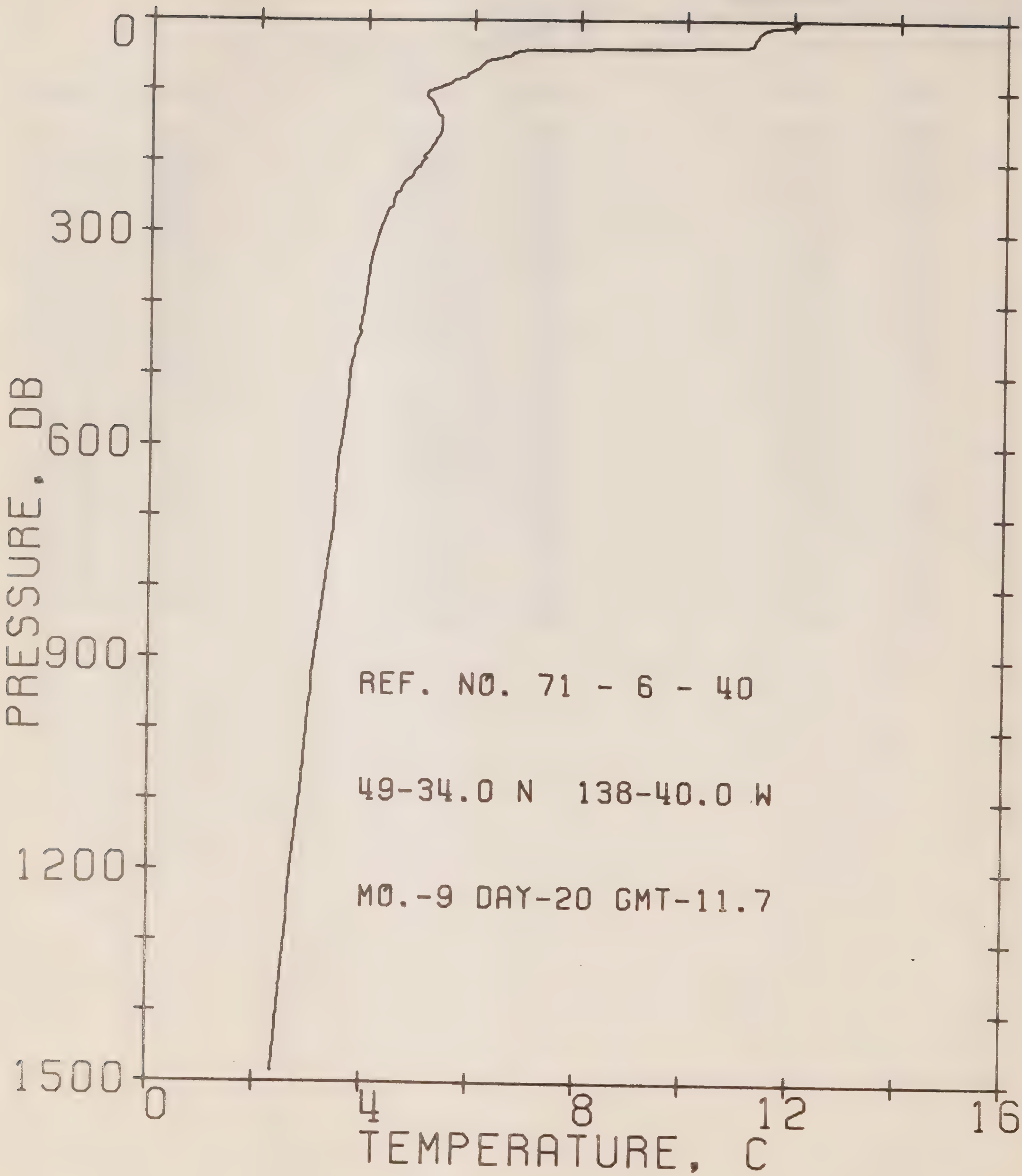
300
600
900
1200
1500
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-039 DATE 19/09/71
POSITION 49-04.1N 140-04.0W GMT 05.5
RESULTS OF STP CAST 68 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	10.77	0081	05.15	0255	04.39
0003	10.77	0084	04.80	0270	04.25
0005	10.53	0087	04.68	0281	04.22
0010	10.47	0090	04.64	0298	04.15
0012	10.45	0092	04.67	0300	04.14
0015	10.27	0095	04.87	0310	04.06
0020	10.16	0100	05.05	0350	03.95
0026	10.05	0105	05.22	0400	03.86
0030	10.03	0110	05.32	0475	03.70
0041	09.99	0115	05.35	0500	03.67
0044	09.93	0120	05.35	0600	03.50
0047	09.90	0125	05.32	0685	03.34
0050	09.70	0131	05.28	0715	03.32
0054	06.34	0135	05.21	0800	03.17
0056	06.04	0150	05.10	0820	03.13
0058	05.96	0167	05.01	0960	02.93
0060	05.95	0173	05.00	1000	02.89
0064	05.82	0183	04.85	1100	02.78
0067	05.75	0200	04.73	1200	02.66
0070	05.61	0204	04.67	1270	02.57
0073	05.55	0216	04.62	1300	02.55
0075	05.44	0226	04.53	1485	02.36
0079	05.35	0250	04.40		


0
300
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900
1200
1500
PRESSURE, DB
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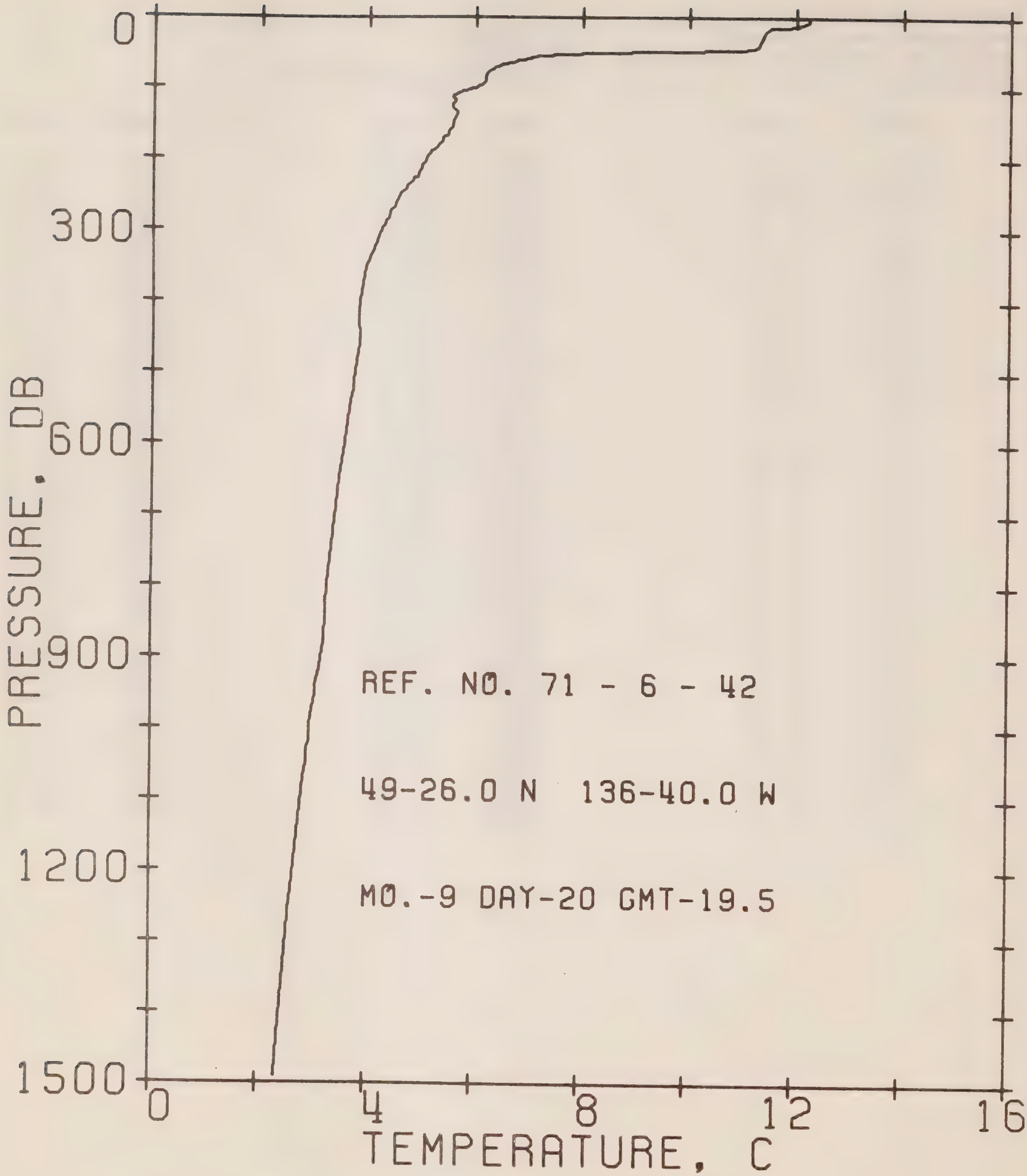
TEMPERATURE, C
REF. NO. 71 - 6 - 40
49-34.0 N 138-40.0 W
MO.-9 DAY-20 GMT-11.7

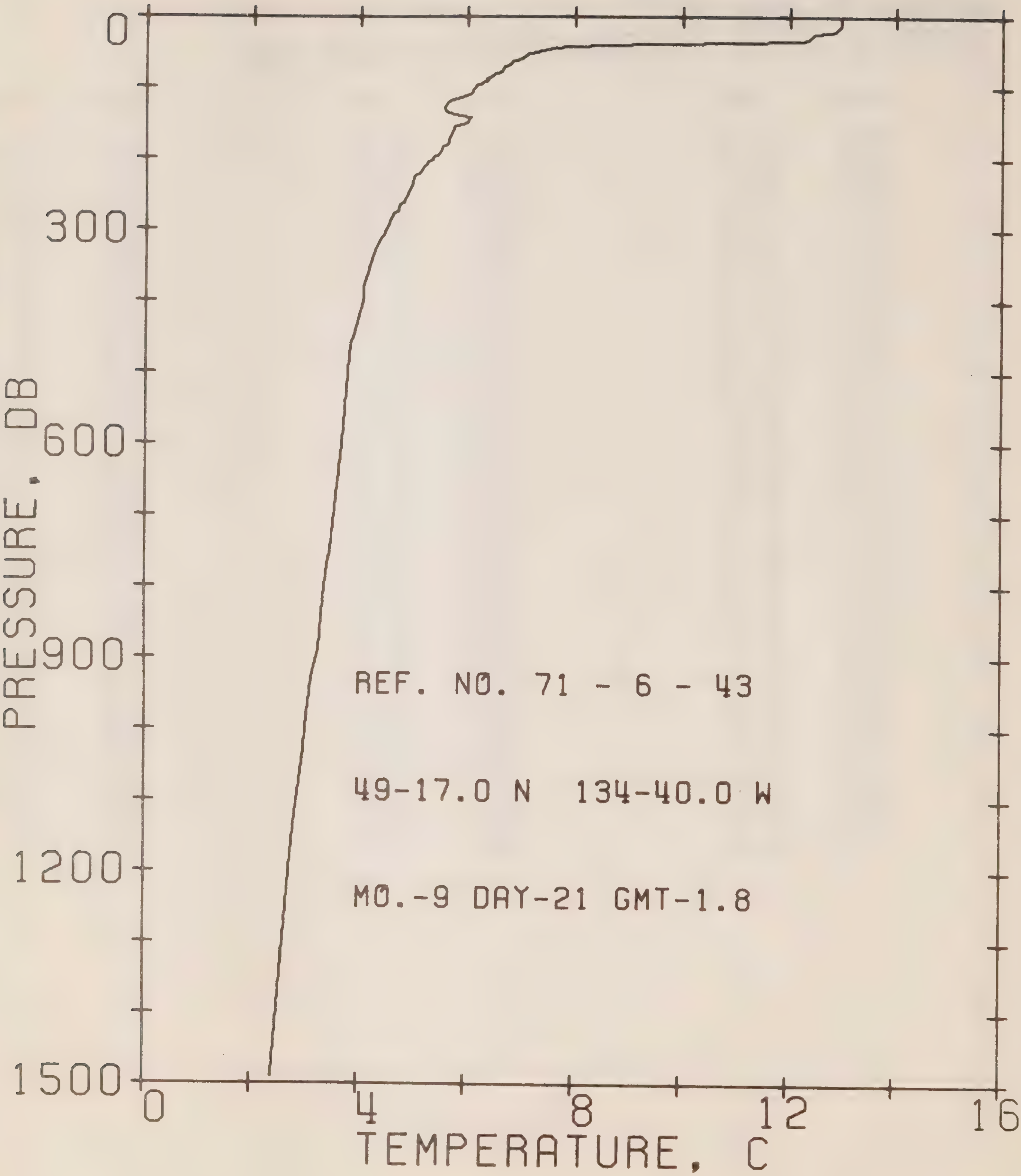
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-040 DATE 20/09/71
POSITION 49-03.4N 138-04.0W GMT 11.7
RESULTS OF STP CAST 92 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	12.09	0107	05.14	0280	04.36
0006	12.08	0109	05.12	0284	04.35
0008	12.05	0116	05.23	0300	04.28
0010	11.59	0119	05.22	0340	04.10
0014	11.45	0125	05.29	0400	04.00
0016	11.40	0134	05.34	0425	03.96
0020	11.37	0139	05.42	0430	03.96
0024	11.33	0144	05.41	0438	03.90
0026	11.30	0150	05.42	0440	03.94
0030	11.29	0159	05.41	0465	03.81
0035	11.25	0164	05.37	0475	03.82
0037	11.20	0167	05.36	0485	03.75
0038	11.11	0170	05.32	0500	03.74
0042	07.25	0175	05.28	0520	03.72
0043	07.00	0179	05.22	0530	03.72
0046	06.76	0183	05.22	0600	03.57
0050	06.71	0194	05.08	0620	03.53
0053	06.62	0196	05.11	0720	03.43
0056	06.37	0200	05.07	0755	03.37
0059	06.23	0208	05.00	0800	03.29
0068	06.10	0210	04.93	0925	03.05
0075	05.92	0220	04.88	0950	03.03
0076	05.90	0226	04.78	0970	02.99
0077	05.90	0238	04.65	1000	02.95
0079	05.88	0242	04.63	1090	02.85
0080	05.89	0246	04.57	1200	02.67
0083	05.80	0250	04.57	1250	02.62
0085	05.65	0256	04.52	1270	02.61
0090	05.58	0264	04.50	1350	02.50
0100	05.21	0269	04.43	1485	02.35
0103	05.12	0274	04.41		


0
300
600
900
1200
1500
PRESSURE, DB
0
4
8
12
16
TEMPERATURE, C
REF. NO. 71 - 6 - 42
49-26.0 N 136-40.0 W
MO.-9 DAY-20 GMT-19.5

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-042 DATE 20/09/71
POSITION 49-02.6N 136-04.0W GMT 19.5
RESULTS OF STP CAST 98 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	12.25	0116	05.62	0300	04.26
0006	12.23	0121	05.62	0325	04.12
0007	12.23	122	05.57	0355	03.97
0010	12.10	0125	05.57	0400	03.87
0012	12.03	0128	05.56	0420	03.84
0014	11.75	0134	05.66	0460	03.86
0015	11.53	0137	05.67	0500	03.80
0020	11.45	0150	05.56	0515	03.76
0030	11.35	0151	05.60	0525	03.77
0040	11.30	0155	05.57	0540	03.70
0044	11.21	0157	05.57	0585	03.64
0046	10.95	0162	05.50	0600	03.60
0050	08.25	0166	05.48	0650	03.50
0055	07.21	0171	05.40	0800	03.29
0057	07.03	0175	05.38	0830	03.25
0058	07.05	0187	05.25	0840	03.24
0061	06.82	0189	05.20	0880	03.22
0064	06.68	0200	05.10	0927	03.13
0066	06.50	0207	05.06	0940	03.08
0068	06.47	0209	05.02	0955	03.07
0070	06.38	0215	05.00	0985	02.98
0075	06.28	0225	04.93	1000	02.97
0080	06.21	0227	04.87	1020	02.96
0083	06.21	0232	04.84	1030	02.90
0084	06.18	0238	04.75	1050	02.90
0086	06.19	0244	04.70	1070	02.85
0091	06.18	0250	04.62	1190	02.70
0095	06.12	0257	04.60	1230	02.65
0100	05.97	0268	04.50	1240	02.62
C106	05.72	0274	04.43	1385	02.45
0109	05.66	0284	04.40	1410	02.43
0110	05.59	0287	04.36	1490	02.34
0114	05.57	0296	04.30		


0
300
600
900
1200
1500
PRESSURE, DB
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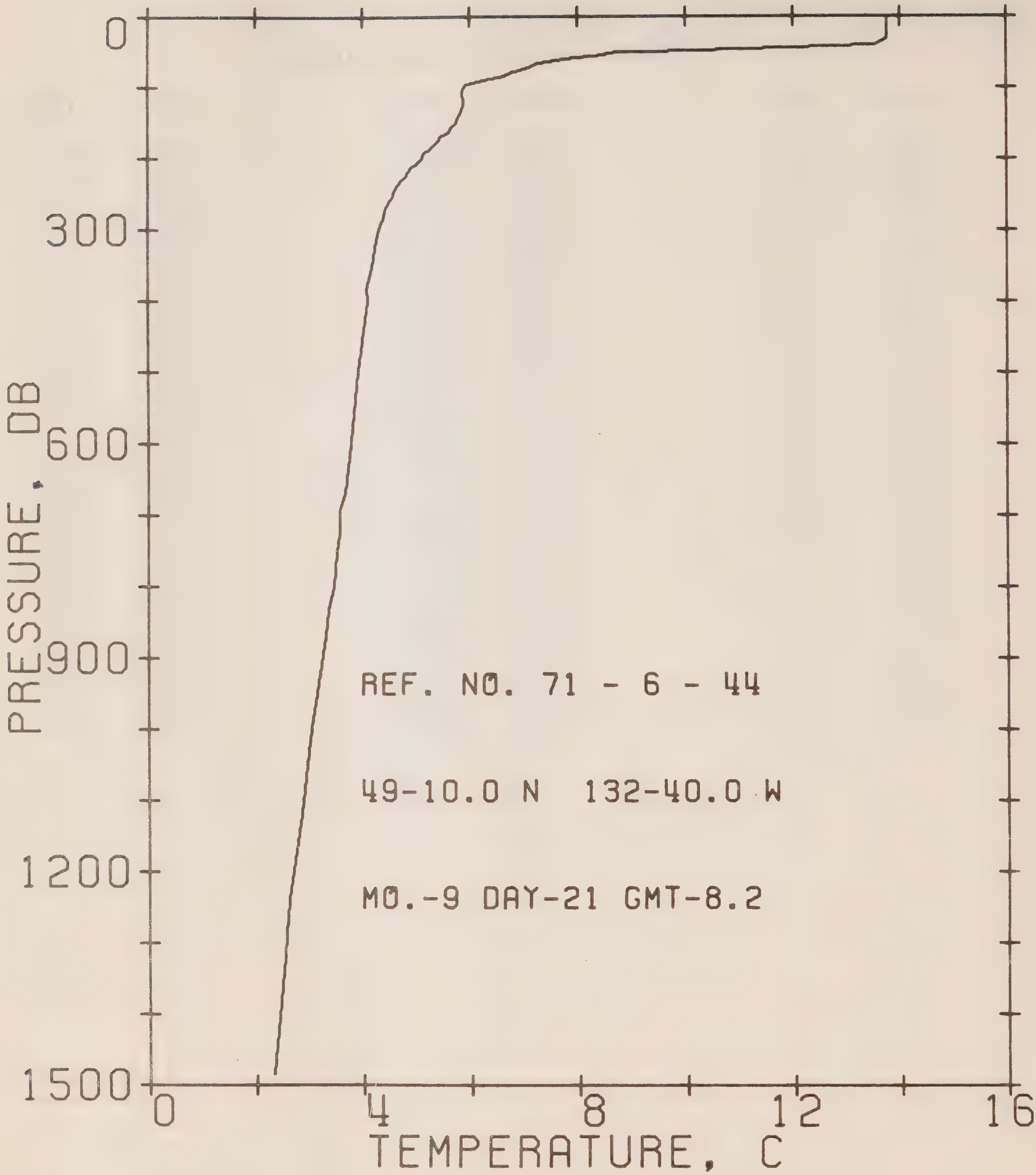
4
8
12
16
TEMPERATURE, C
REF. NO. 71 - 6 - 43
49-17.0 N 134-40.0 W
MO.-9 DAY-21 GMT-1.8

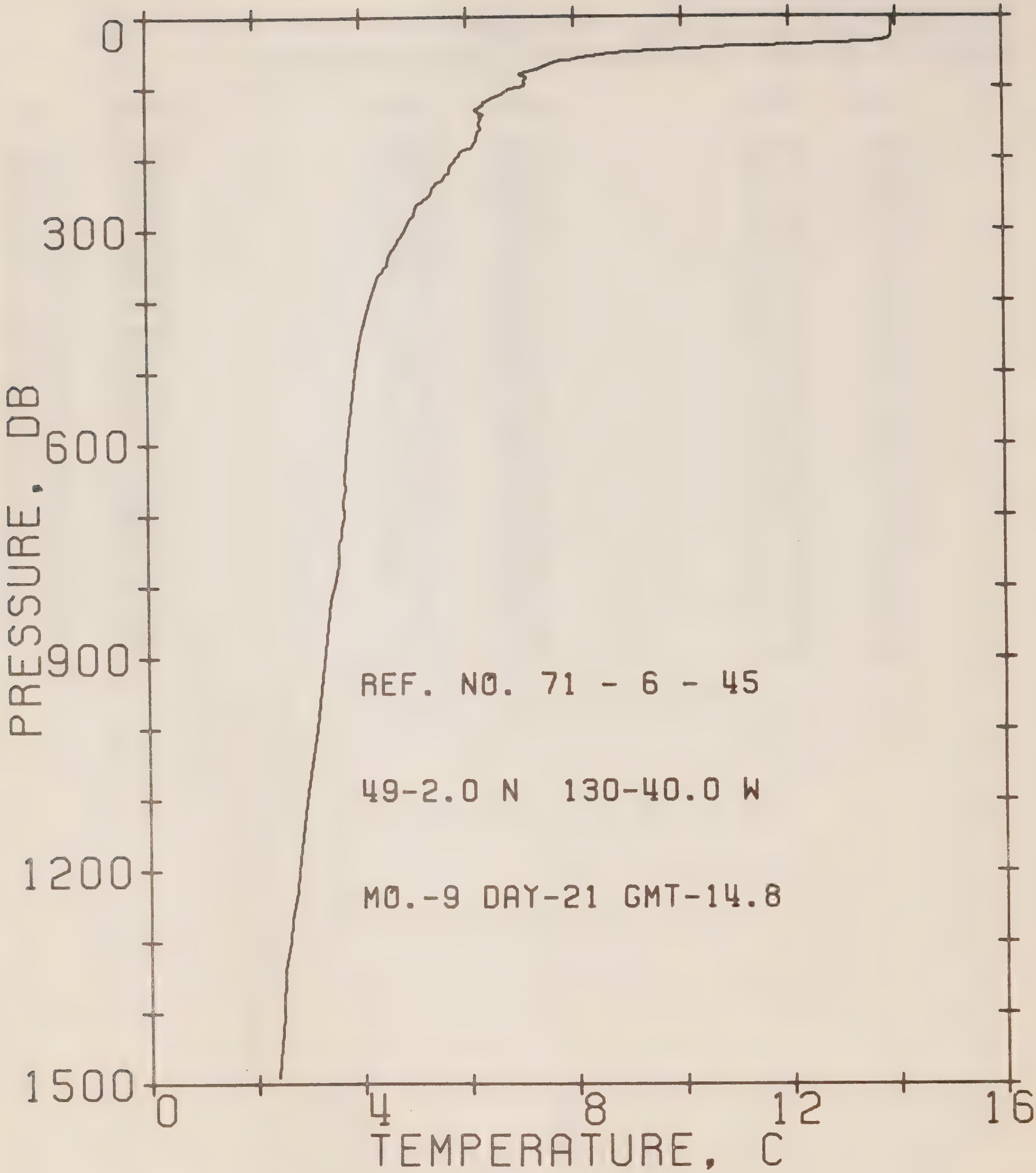
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-043 DATE 21/09/71
POSITION 49-01.7N 134-04.0W GMT 01.8
RESULTS OF STP CAST 83 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	12.95	0089	06.35	0250	04.90
0010	12.95	0091	06.39	0262	04.83
0013	12.95	0094	06.27	0265	04.76
0020	12.85	0096	06.27	0274	04.72
0022	12.75	0097	06.19	0277	04.64
0024	12.45	0100	06.15	0290	04.55
0030	12.36	0110	06.05	0300	04.52
0032	12.34	0120	05.66	0310	04.42
0034	12.18	0125	05.60	0330	04.30
0038	09.78	0129	05.57	380	04.08
0041	08.32	0134	05.60	0400	04.07
0042	08.25	0138	05.75	0450	03.90
0043	07.95	0142	06.08	460	03.85
0045	07.60	0150	06.00	0500	03.78
0050	07.28	0154	05.78	0600	03.67
0055	07.10	0158	05.75	0730	03.50
0060	07.01	0160	05.77	0755	03.47
0063	06.85	0175	05.66	0770	03.41
0066	06.82	0179	05.66	0800	03.37
0068	06.77	0184	05.55	0840	03.30
0069	06.80	0190	05.52	0890	03.25
0071	06.70	0200	05.36	0930	03.13
0075	06.67	0202	05.35	1000	03.00
0080	06.57	0204	05.27	1030	02.99
0081	06.51	0218	05.15	1120	02.83
0082	06.51	0226	05.02	1200	02.72
0084	06.45	0236	04.98	1490	02.39
0086	06.42	0242	04.95		


0
300
600
900
1200
1500
PRESSURE, DB
0
4
8
12
16
TEMPERATURE, C
REF. NO. 71 - 6 - 44
49-10.0 N 132-40.0 W
MO.-9 DAY-21 GMT-8.2

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-044 DATE 21/09/71
POSITION 49-01.0N 132-04.0W GMT 08.2
RESULTS OF STP CAST 71 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	13.75	0125	05.90	0300	04.32
0010	13.75	0134	05.88	0315	04.27
0020	13.75	0150	05.75	0355	04.18
0030	13.75	0156	05.67	0385	04.08
0032	13.75	0164	05.62	0400	04.10
0038	13.58	0169	05.50	0500	03.92
0041	13.52	0175	05.42	0600	03.80
0044	11.90	0187	05.28	0670	03.67
0050	09.25	0193	05.17	0695	03.58
0051	08.80	0200	05.11	0726	03.57
0053	08.53	0208	05.02	0755	03.52
0055	08.54	0212	04.94	0800	03.47
0058	07.98	0220	04.85	0835	03.35
0062	07.60	0224	04.84	0870	03.30
0066	07.28	0230	04.74	0950	03.16
0069	07.20	0240	04.65	1000	03.04
0071	07.18	0250	04.58	1120	02.85
0075	06.93	0252	04.58	1200	02.70
0080	06.75	0256	04.55	1240	02.62
0084	06.66	0260	04.50	1290	02.55
0090	06.26	0267	04.48	1320	02.53
0097	05.95	0270	04.45	1425	02.39
0100	05.91	0274	04.44	1485	02.33
0106	05.88	0284	04.40		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600
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1200
1500
PRESSURE, DB
REF. NO. 71 - 6 - 45
49-2.0 N 130-40.0 W
MO.-9 DAY-21 GMT-14.8
0
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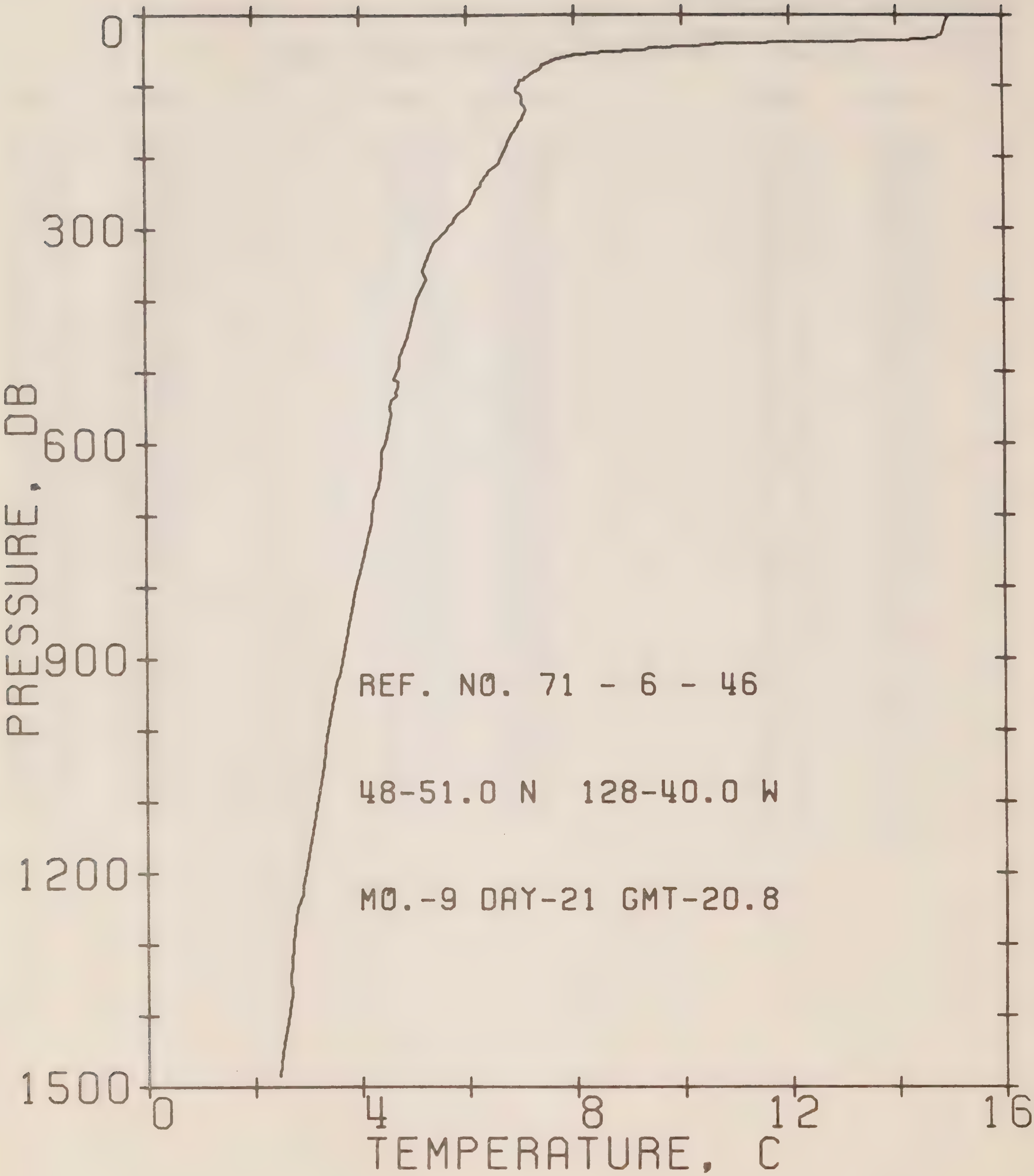
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-045 DATE 21/09/71
POSITION 49-00.2N 130-04.0W GMT 14.8
RESULTS OF STP CAST 94 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	13.93	0116	06.45	0287	04.93
0010	13.93	0123	06.31	0292	04.91
0020	13.93	0125	06.31	0300	04.86
0028	13.92	0127	06.27	0335	04.55
0030	13.90	0128	06.27	0350	04.51
0033	13.85	0130	06.18	0365	04.35
0034	13.72	0132	06.17	0400	04.20
0036	13.50	0135	06.20	0450	04.00
0042	11.40	0138	06.33	0500	03.90
0043	11.00	0142	06.23	0600	03.73
0046	10.15	0145	06.29	0625	03.70
0050	09.02	0148	06.28	0655	03.68
0052	08.68	0150	06.24	0660	03.71
0056	08.31	0160	06.26	0675	03.69
0058	08.10	0164	06.22	0680	03.65
0062	07.90	0175	06.20	0705	03.67
0063	07.75	0187	06.08	0720	03.64
0066	07.59	0189	05.95	0730	03.64
0070	07.46	0200	05.80	0740	03.58
0075	07.25	0214	05.67	0770	03.56
0081	07.01	0220	05.67	0800	03.50
0083	06.99	0224	05.60	0820	03.42
0085	07.10	0230	05.57	1000	03.14
0088	07.13	0235	05.45	1090	02.95
0093	07.07	0240	05.38	1200	02.77
0095	07.11	0245	05.35	1230	02.75
0098	07.10	0250	05.34	1270	02.65
0100	06.95	0253	05.30	1300	02.62
0102	06.80	0265	05.10	1340	02.52
0105	06.77	0273	05.05	1405	02.49
0108	06.68	0280	05.02	1490	02.37
0112	06.60				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900
1200
1500
PRESSURE, DB
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4
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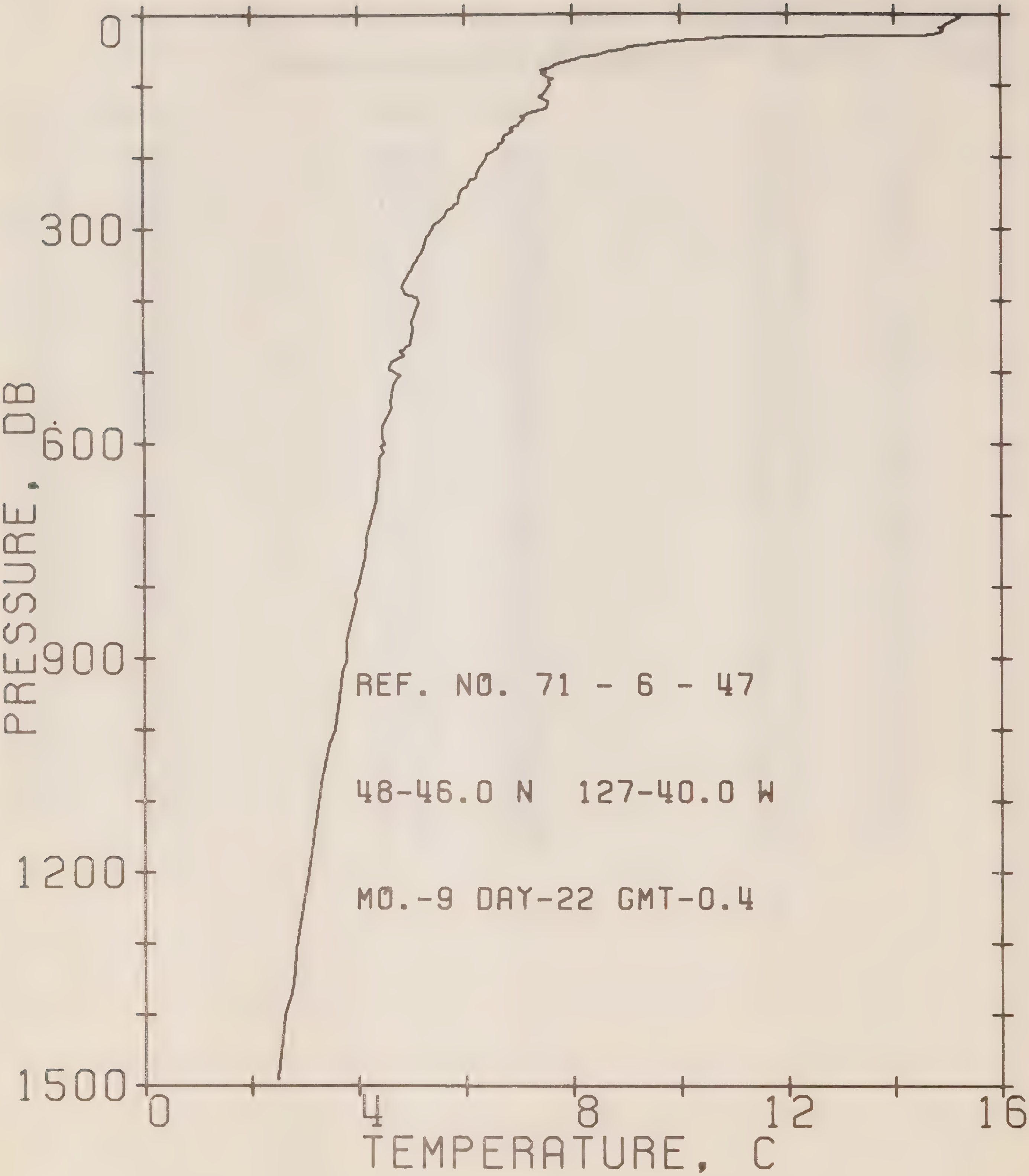
12
16
TEMPERATURE, C
REF. NO. 71 - 6 - 46
48-51.0 N 128-40.0 W
MO.-9 DAY-21 GMT-20.8

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-046 DATE 21/09/71
POSITION 48-05.1N 128-04.0W GMT 20.8
RESULTS OF STP CAST 95 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	14.97	0125	07.05	0512	04.71
0001	15.00	0130	07.10	0520	04.71
0008	14.95	0136	07.11	0530	04.67
0010	14.93	0150	07.02	0532	04.69
0020	14.91	0175	06.80	0540	04.59
0025	14.89	0182	06.77	0550	04.56
30	14.81	0200	06.66	0560	04.59
0033	14.75	0210	06.58	0570	04.57
0036	14.10	0216	06.49	0600	04.47
0040	10.77	0220	06.42	0612	04.41
0045	10.20	0224	06.39	0630	04.41
0047	09.42	0227	06.38	0660	04.35
0050	09.30	0237	06.27	0680	04.25
0053	08.50	0241	06.27	0710	04.22
0054	08.45	0246	06.18	0780	04.00
0056	08.05	0250	06.16	0800	03.93
0060	07.82	0264	06.07	0925	03.60
0062	07.70	0282	05.81	0935	03.54
0065	07.60	0284	05.81	1000	03.40
0067	07.60	0285	05.78	1010	03.35
0070	07.45	0290	05.77	1050	03.30
0075	07.40	0298	05.65	1200	02.95
0082	07.22	0300	05.65	1220	02.91
0086	07.18	0320	05.40	1230	02.91
0088	07.12	0360	05.17	1250	02.81
0092	07.10	0370	05.24	1280	02.75
0093	07.02	0400	05.07	1350	02.68
0100	06.99	0450	04.91	1370	02.69
0103	06.94	0480	04.75	1410	02.62
0108	06.92	0495	04.75	1440	02.53
0113	07.01	0500	04.70	1485	02.46
0120	07.05	0510	04.64		


0
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1200
1500
PRESSURE, DB
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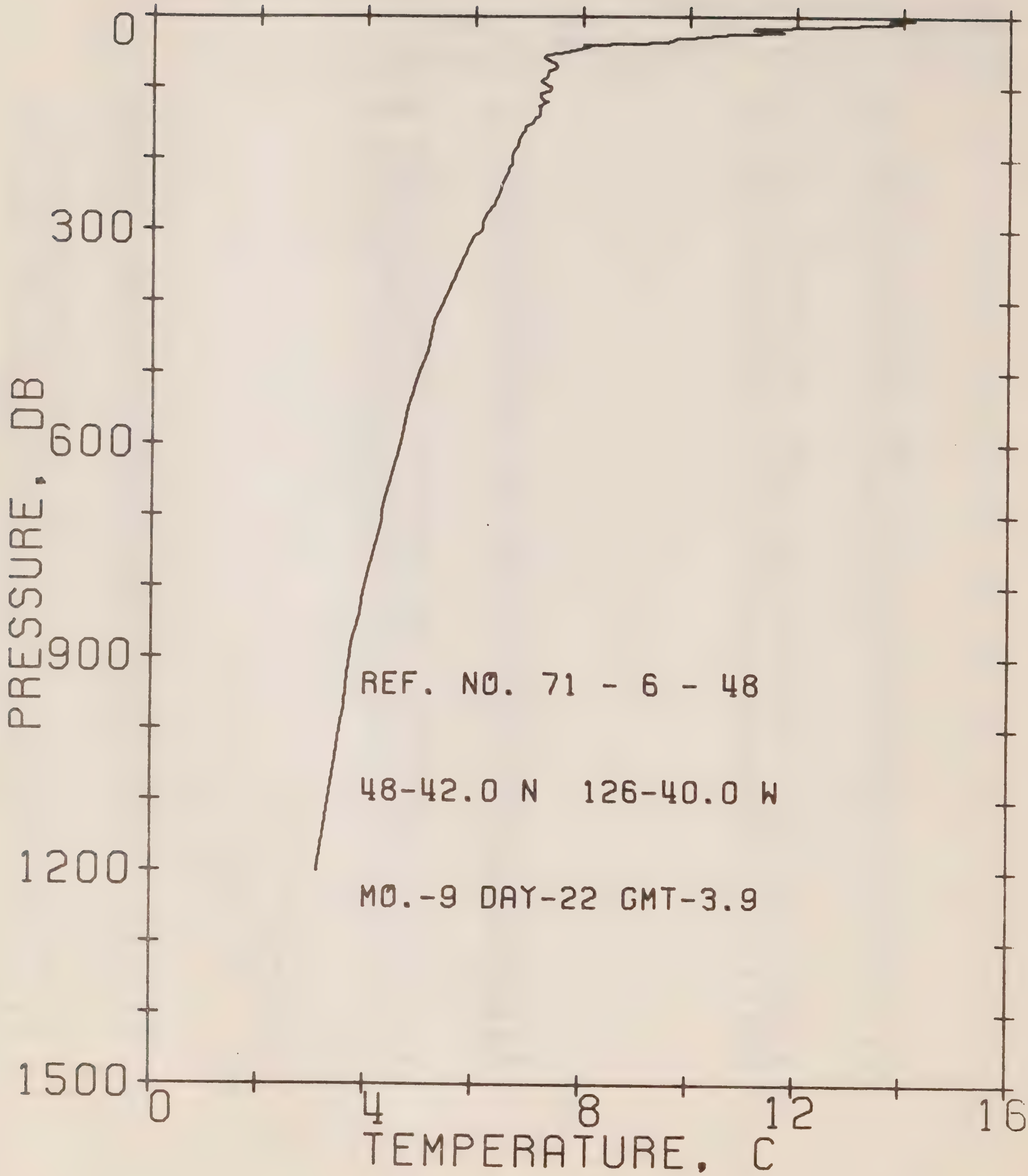
16
TEMPERATURE, C
REF. NO. 71 - 6 - 47
48-46.0 N 127-40.0 W
MO.-9 DAY-22 GMT-0.4

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-047 DATE 22/09/71
POSITION 48-04.6N 127-04.0W GMT 00.4
RESULTS OF STP CAST 125 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	15.19	0142	07.07	0430	05.02
0001	15.23	0144	07.07	0440	05.05
0005	15.24	0146	07.13	0460	04.98
0010	15.06	0150	07.07	0470	04.79
0014	14.99	0153	07.04	0475	04.87
0016	14.97	0154	07.01	0485	04.65
0018	14.84	0156	07.01	0495	04.60
0020	14.92	0157	06.93	0500	04.71
0022	14.88	0160	06.86	0505	04.81
0024	14.92	0162	06.90	0510	04.72
0028	14.73	0164	06.90	0520	04.66
0030	14.50	0168	06.78	0545	04.62
0033	10.90	0175	06.72	0550	04.63
0035	10.70	0177	06.75	0575	04.46
0038	09.90	0179	06.73	0590	04.45
0041	09.63	0182	06.65	0600	04.50
0043	09.55	0187	06.65	0602	04.44
0046	09.03	0190	06.55	0612	04.49
0050	08.95	0197	06.42	0620	04.40
0053	08.70	0200	06.42	0645	04.40
0058	08.45	0204	06.41	0655	04.36
0060	08.20	0212	06.33	0680	04.35
0064	08.05	0222	06.25	0730	04.17
0070	07.70	0228	06.23	0740	04.17
0075	07.61	0231	06.12	0770	04.10
0077	07.56	0240	06.05	0800	04.00
0079	07.45	0242	06.00	0810	03.95
0082	07.53	0250	05.91	0820	03.97
0084	07.44	0262	05.90	0875	03.80
0085	07.53	0264	05.84	0905	03.78
0087	07.49	0269	05.81	0920	03.70
0089	07.55	0272	05.72	0940	03.69
0091	07.65	0275	05.68	1000	03.57
0094	07.58	0282	05.64	1020	03.47
0100	07.61	0296	05.42	1075	03.30
0110	07.50	0300	05.42	1200	03.07
0116	07.38	0310	05.30	1310	02.83
0122	07.56	0325	05.25	1340	02.81
0125	07.57	0380	04.83	1370	02.75
0133	07.53	0390	04.92	1400	02.62
0138	07.20	0395	05.13	1490	02.49
0141	07.18	0405	05.15		


0
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900
1200
1500
PRESSURE, DB
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TEMPERATURE, C
REF. NO. 71 - 6 - 48
48-42.0 N 126-40.0 W
MO.-9 DAY-22 GMT-3.9

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-048 DATE 22/09/71
POSITION 48-04.2N 126-04.0W GMT 03.9
RESULTS OF STP CAST 96 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	14.00	0066	07.50	0185	06.79
0001	13.93	0068	07.50	0188	06.75
0004	14.20	0070	07.54	0195	06.72
0005	13.80	0075	07.45	0196	06.70
0007	13.74	0077	07.40	0200	06.69
0008	13.95	0084	07.36	0210	06.70
0010	13.63	0093	07.23	0214	06.65
0013	12.75	0100	07.42	0220	06.65
0015	12.55	0102	07.45	0240	06.52
0017	11.25	0105	07.38	0250	06.49
0019	11.17	0107	07.38	0268	06.35
20	11.66	0109	07.21	0275	06.27
0021	11.58	0112	07.23	0293	06.16
0022	11.77	0114	07.21	0300	06.15
0024	10.94	0116	07.25	0310	06.01
0026	10.49	0119	07.25	0400	05.47
0028	10.35	0121	07.36	0430	05.29
0030	09.87	0122	07.27	0470	05.17
0031	09.79	0125	07.22	0500	05.01
0034	09.65	0127	07.17	0550	04.80
0036	09.55	0129	07.23	0600	04.67
0038	08.90	0132	07.23	0695	04.33
0040	08.10	0135	07.19	0710	04.33
0041	08.00	0140	07.19	0800	04.01
0043	08.12	0142	07.14	0820	03.94
0046	07.91	0150	07.10	0840	03.92
0050	07.72	0152	07.00	0880	03.77
0053	07.56	0156	06.93	0940	03.65
0055	07.34	0162	06.92	0970	03.62
0058	07.28	0166	06.88	1000	03.54
0060	07.33	0175	06.84	1040	03.46
0063	07.35	0182	06.79	1200	03.11

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-049   DATE 22/09/71
POSITION 48-03.8N 126-04.0W   GMT 06.4
RESULTS OF STP CAST   38 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	14.22	0026	09.70	0054	07.43
0004	14.23	0028	10.17	0056	07.25
0006	13.95	0030	09.88	0060	07.50
0007	13.40	0032	09.86	0063	07.47
0008	13.69	0034	09.05	64	07.43
0010	13.45	0038	08.65	0069	07.38
0013	12.05	0041	08.53	0071	07.34
0014	11.90	0042	08.37	0075	07.28
0015	12.30	0044	08.28	0078	07.20
0018	10.73	0048	07.69	0082	07.00
0020	10.60	0050	07.69	0085	06.96
0022	10.25	0051	07.69	0100	06.97
0024	09.95	0052	07.73		

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71-06-050 DATE 22/09/71
POSITION 48-03.3N 125-03.3W GMT 08.0
RESULTS OF STP CAST 44 POINTS TAKEN FROM ANALOG TRACE

DEPTH	TEMP	DEPTH	TEMP	DEPTH	TEMP
0000	10.50	0024	10.00	0058	07.90
0002	10.33	0026	09.82	0062	07.83
0003	10.31	0028	09.71	0064	07.70
0004	10.32	0030	09.38	71	07.63
0006	10.28	0031	09.31	0073	07.47
0008	10.28	0033	09.25	0075	07.47
0010	10.05	0034	09.08	0080	07.40
0011	10.03	0038	08.72	0081	07.25
0014	10.07	0040	08.55	0090	07.15
0016	10.02	0042	08.48	0100	07.07
0018	10.02	0043	08.39	0104	06.90
0019	10.06	0046	08.27	0109	06.85
0020	10.02	0050	08.22	0110	06.80
0022	10.03	0054	08.22	0115	06.78
0023	09.98	0055	08.05		

SURFACE TEMPERATURE AND SALINITY OBSERVATIONS

(P-71-6)

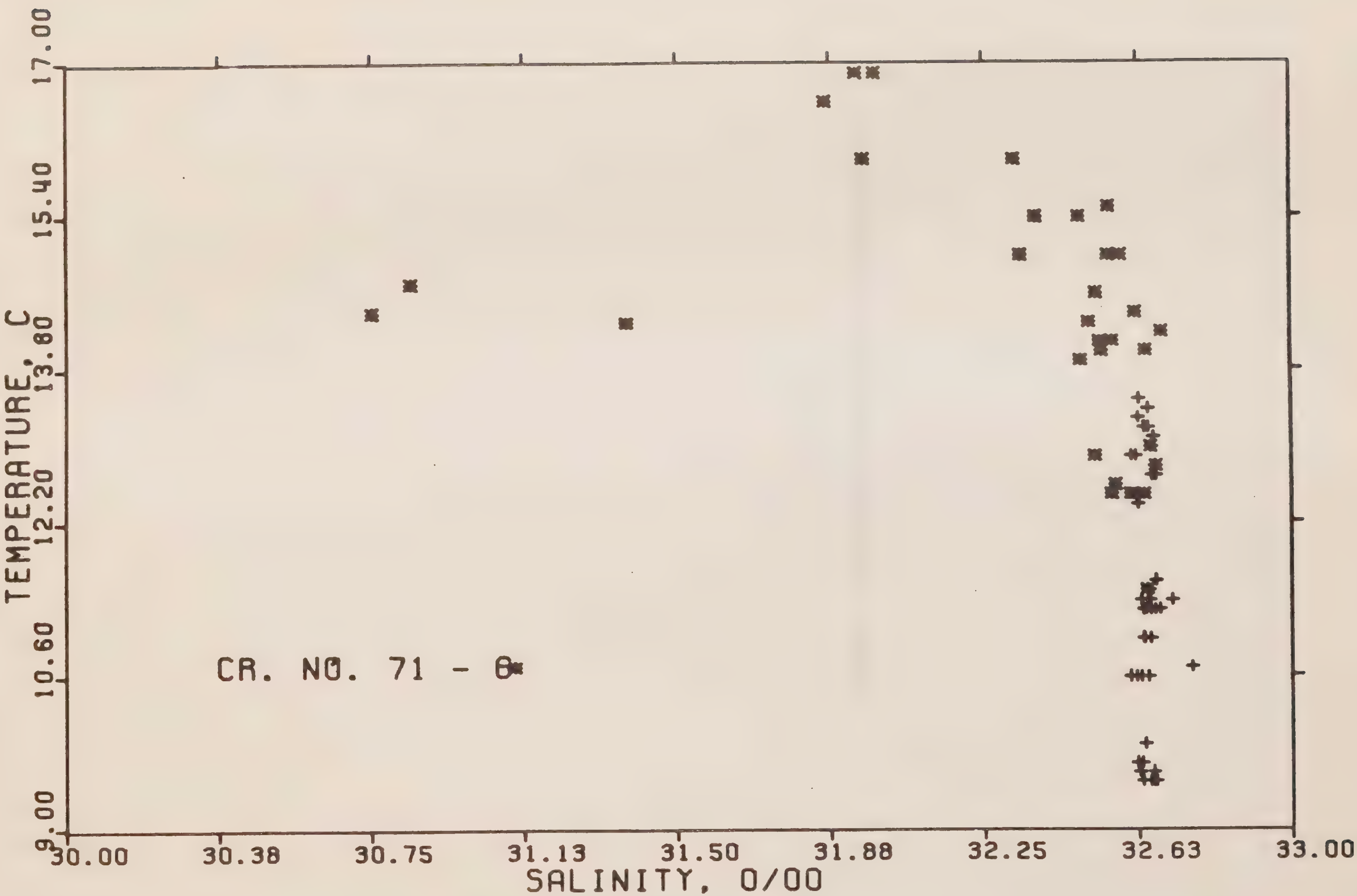


Fig. 9 T-S plot of surface temperature and salinity observations on Line P (asterisks) and at Station P (pluses) during Cruise P-71-6.

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 6

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	8	6	2315	31.376	14.3	125-33
71	8	7	55	31.956	16.0	126- 0
71	8	7	330	31.983	16.9	126-40
71	8	7	655	31.939	16.9	127-40
71	8	7	1230	31.863	16.6	128-40
71	8	7	1620	32.324	16.0	129-40
71	8	7	1915	32.553	15.5	130-40
71	8	7	2300	32.481	15.4	131-40
71	8	8	230	32.552	15.0	132-40
71	8	8	555	32.521	14.6	133-40
71	8	8	900	32.581	15.0	134-40
71	8	8	1230	32.561	14.1	135-40
71	8	8	1520	32.618	14.4	136-40
71	8	8	2020	32.641	14.0	137-40
71	8	8	2330	32.681	14.2	138-40
71	8	9	300	32.654	13.0	139-40
71	8	9	605	32.667	12.8	140-40
71	8	9	1000	32.656	12.7	141-40
71	8	9	1330	32.666	12.7	142-40
71	8	9	1820	32.655	13.0	143-40
71	8	10	0	32.662	12.7	145- 0
71	8	11	0	32.664	12.8	ON STATION
71	8	12	0	32.661	13.1	ON STATION
71	8	13	0	32.648	13.4	ON STATION
71	8	14	0	32.639	13.2	ON STATION
71	8	15	0	32.647	13.2	ON STATION
71	8	16	C	32.617	12.9	ON STATION
71	8	17	0	32.625	13.5	ON STATION
71	8	18	0	32.624	13.3	ON STATION
71	8	19	0	32.606	12.9	ON STATION
71	8	20	0	32.623	12.4	ON STATION
71	8	22	0	32.667	11.6	ON STATION
71	8	23	0	32.637	11.0	ON STATION
71	8	24	0	32.653	11.3	ON STATION
71	8	25	0	32.664	11.3	ON STATION
71	8	26	0	32.706	11.4	ON STATION
71	8	27	0	32.648	11.4	ON STATION
71	8	28	0	32.631	11.4	ON STATION
71	8	29	0	32.637	11.3	ON STATION
71	8	30	0	32.649	11.5	ON STATION
71	8	31	0	32.652	11.4	ON STATION
71	9	1	0	32.675	11.3	ON STATION
71	9	2	0	32.653	11.3	ON STATION
71	9	3	0	32.641	11.3	ON STATION
71	9	4	0	32.637	11.3	ON STATION
71	9	5	0	32.638	11.0	ON STATION
71	9	6	C	32.654	11.0	ON STATION
71	9	7	0	32.604	10.6	ON STATION
71	9	8	0	32.754	10.7	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 6

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	9	8	0	32.754	10.7	ON STATION
71	9	9	0	32.647	10.6	ON STATION
71	9	10	0	32.630	10.6	ON STATION
71	9	11	0	32.640	9.9	ON STATION
71	9	13	0	32.667	9.5	ON STATION
71	9	14	0	32.660	9.5	ON STATION
71	9	15	0	32.633	9.7	ON STATION
71	9	16	0	32.622	9.7	ON STATION
71	9	17	0	32.654	9.5	ON STATION
71	9	18	0	32.635	9.5	ON STATION
71	9	19	0	32.627	9.6	ON STATION
71	9	19	2330	32.661	9.6	142-40
71	9	20	240	32.620	10.6	141-40
71	9	20	900	32.646	11.5	139-40
71	9	20	1200	32.613	12.5	138-40
71	9	20	1510	32.638	12.5	137-40
71	9	20	1800	32.606	12.5	136-40
71	9	20	2200	32.560	12.5	135-40
71	9	21	145	32.568	12.6	134-40
71	9	21	510	32.518	12.9	133-40
71	9	21	815	32.484	13.9	132-40
71	9	21	1145	32.535	14.0	131-40
71	9	21	1450	32.532	14.1	130-40
71	9	21	1800	32.505	14.3	129-40
71	9	21	2100	32.339	15.0	128-40
71	9	22	20	32.375	15.4	127-40
71	9	22	350	30.847	14.7	126-40
71	9	22	615	30.752	14.4	126- 0
71	9	22	800	31.103	10.7	125-33

OCEANOGRAPHIC DATA OBTAINED ON CRUISE P-71-7

(C. O. D. C. REFERENCE NO. 02-71-007)

COMPOSITE PLOTS OF TEMPERATURE, SALINITY

AND DISSOLVED OXYGEN VS DEPTH

(P-71-7)

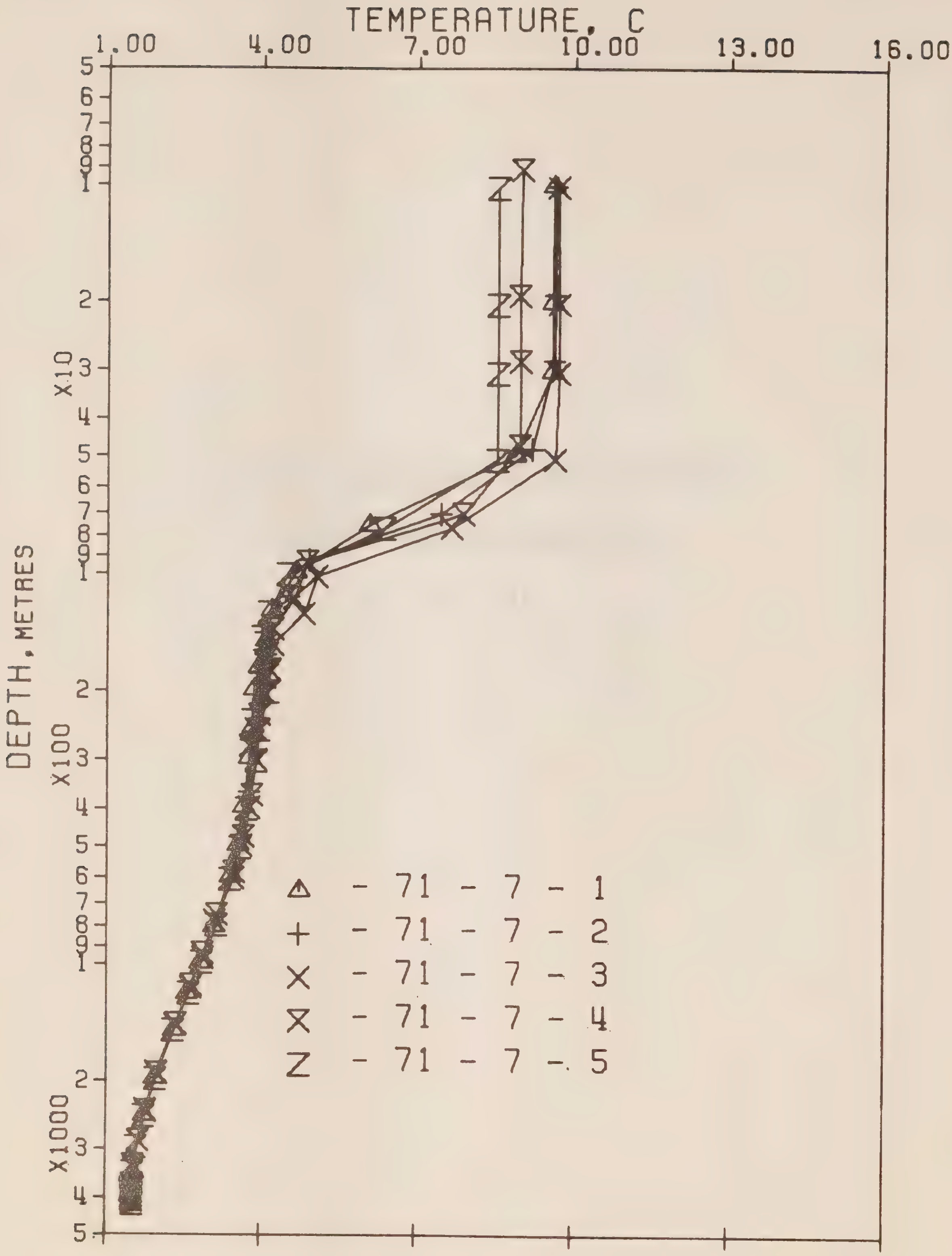


Fig. 10 Composite plot of temperature vs $\log_{10}$ depth P-71-7.

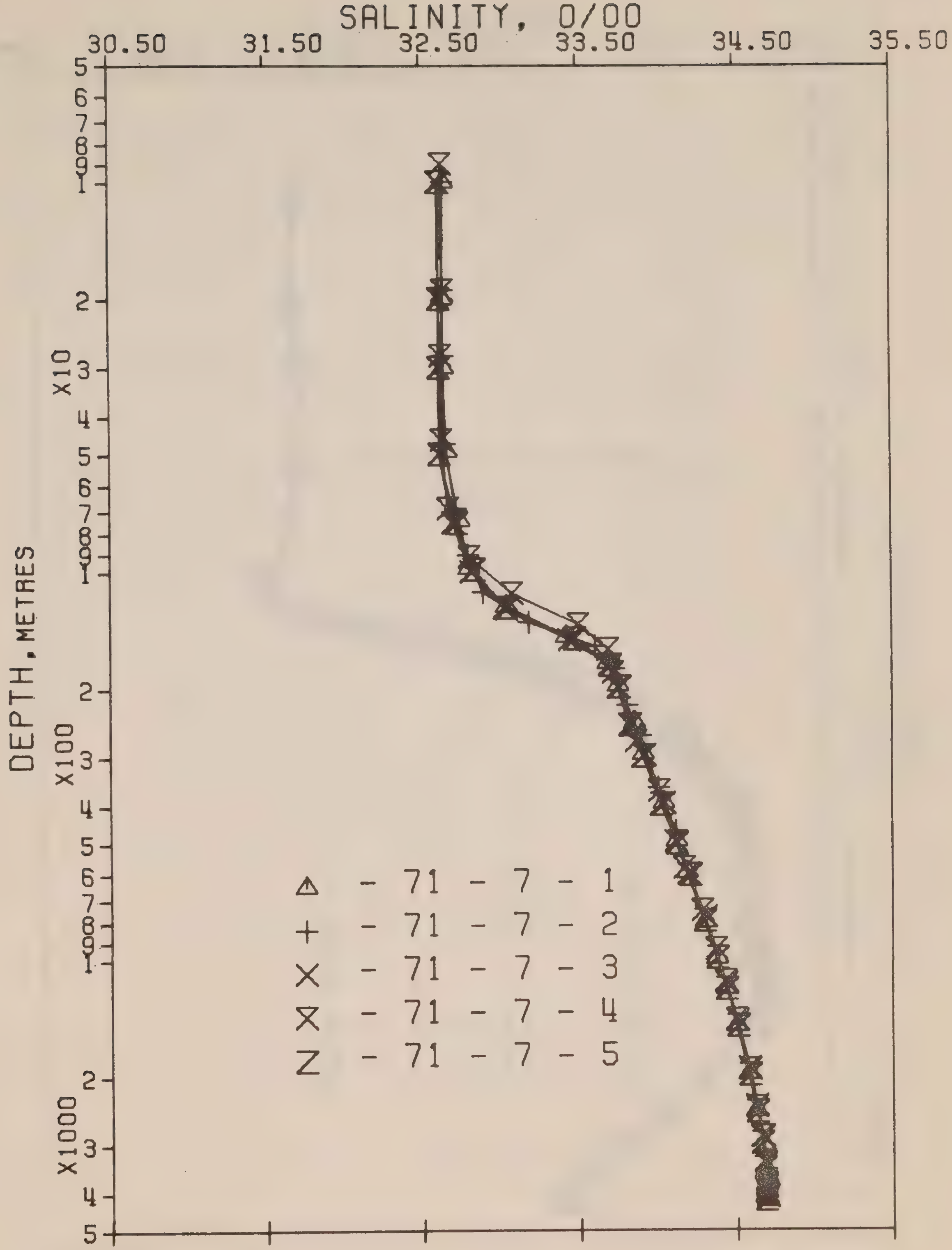


Fig. 11 Composite plot of salinity vs $\log_{10}$ depth P-71-7.

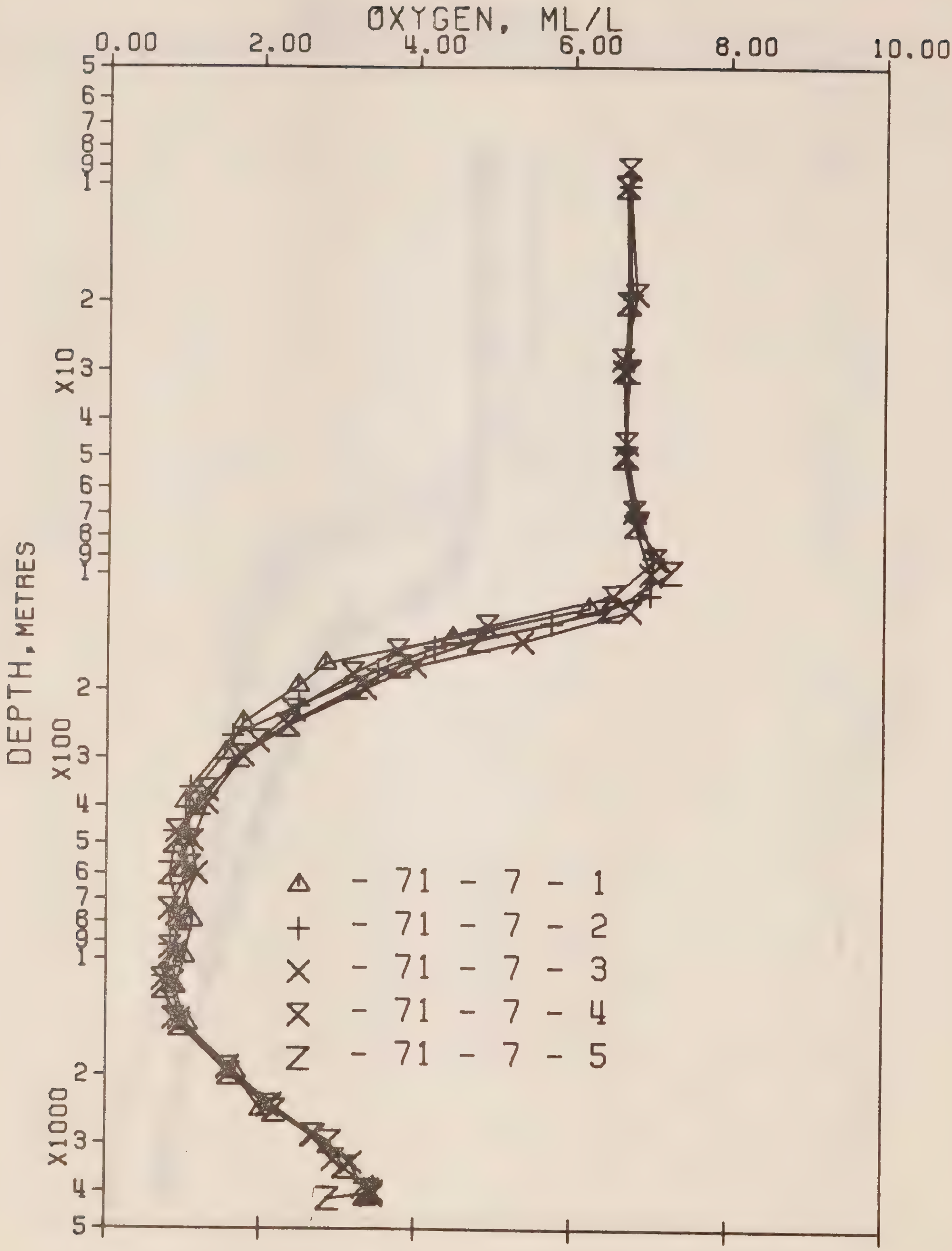
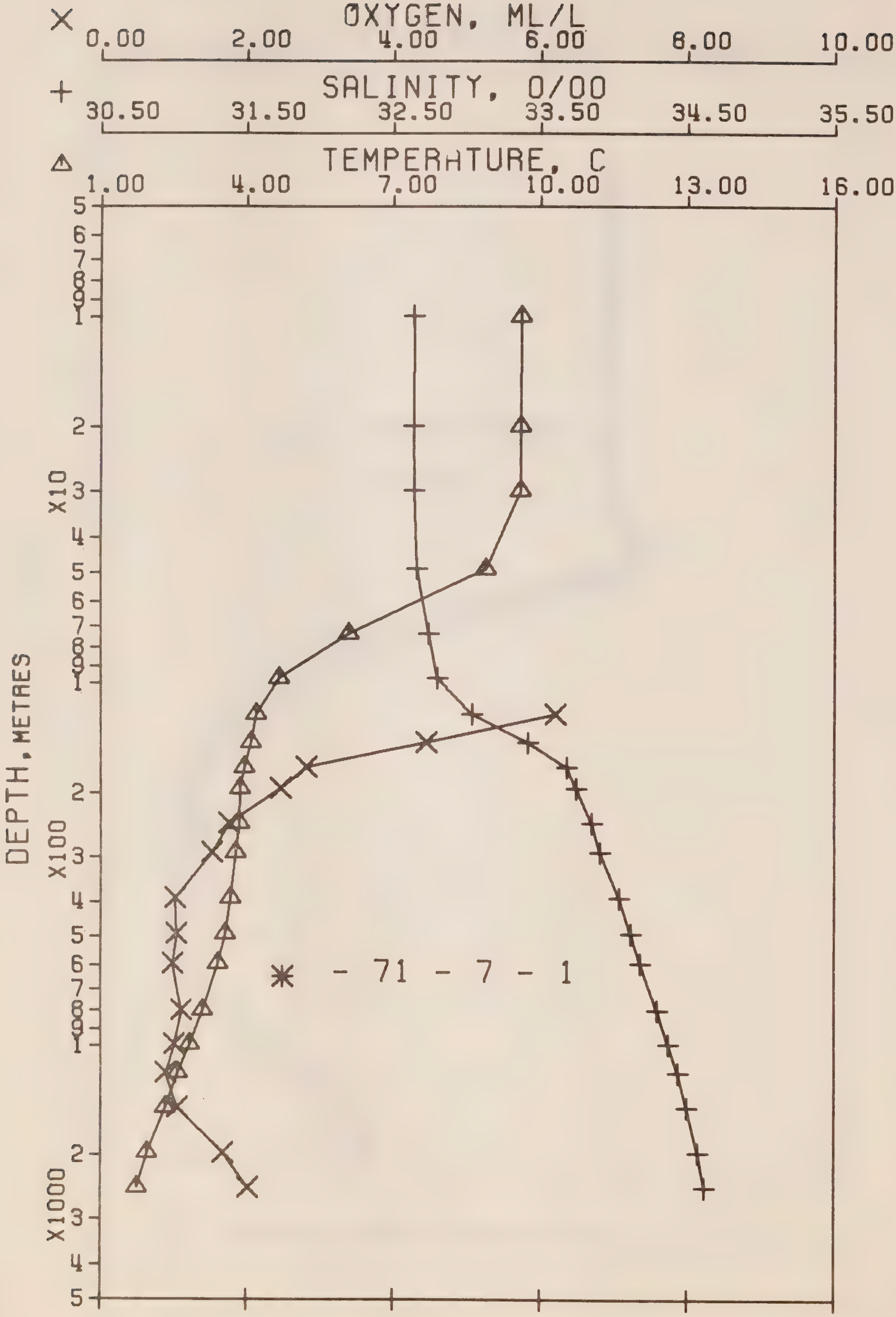


Fig. 12 Composite plot of oxygen vs $\log_{10}$ depth P-71-7.

RESULTS OF BOTTLE CASTS

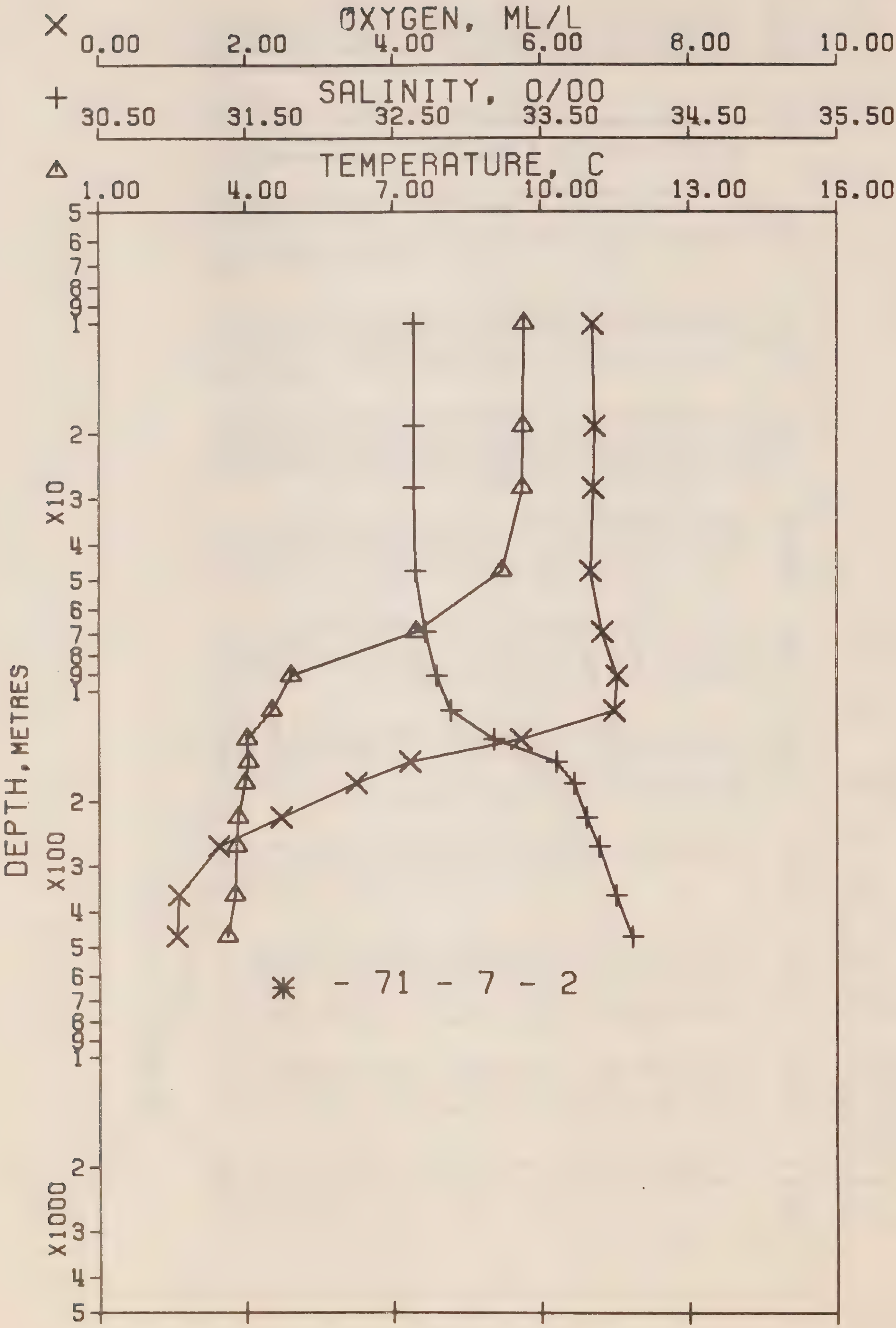
(P-71-7)



X OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
+ SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
✱ - 71 - 7 - 1

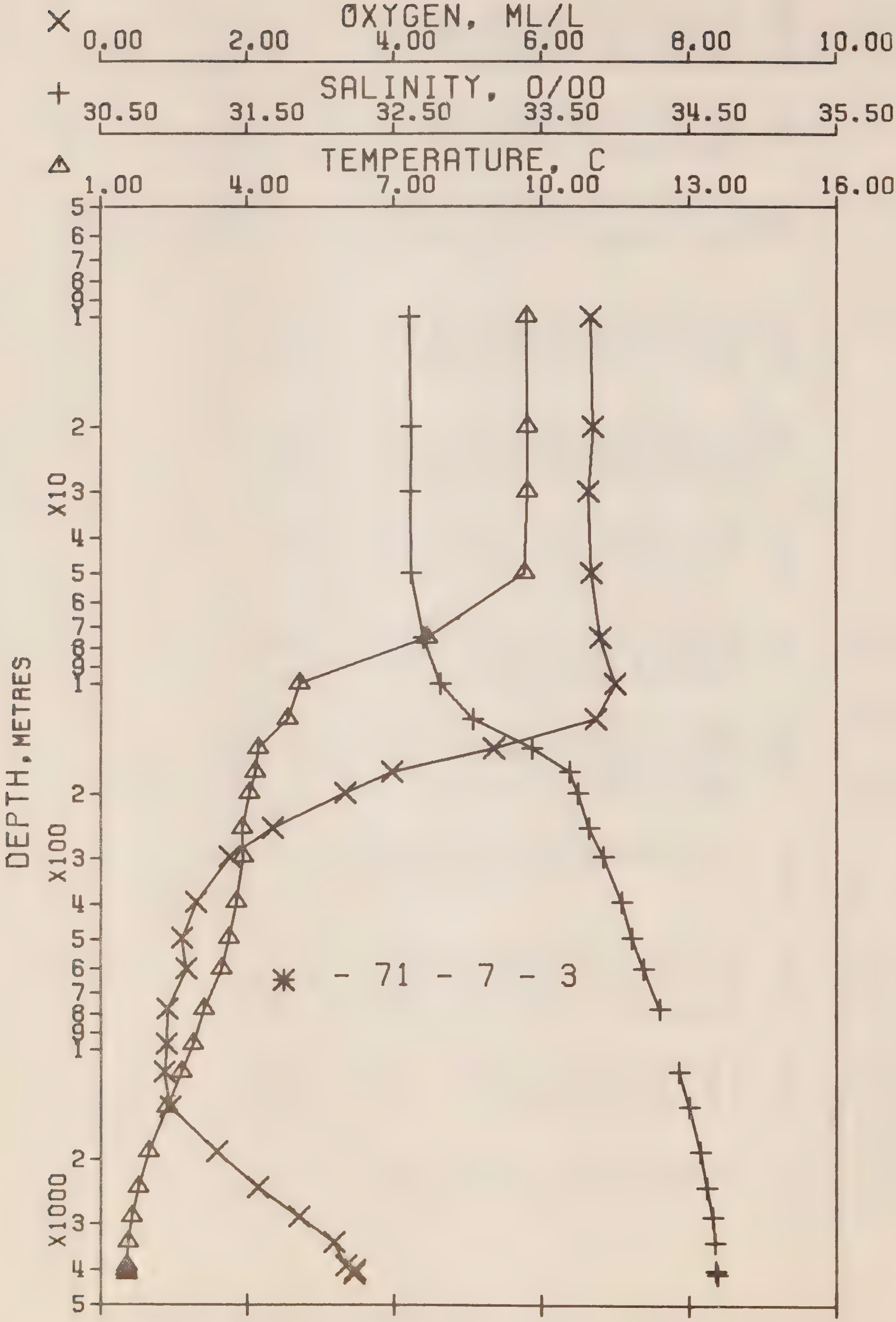
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 7- 1 DATE 27/ 9/71
POSITION 50- 7.0 N, 145- 3.0 W GMT 19.0
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	9.61	32.645	0	25.203	277.6	9.61	277.4	0.0	0.0	0.0	1486.
10	9.61	32.644	10	25.202	277.9	9.61	277.5	0.28	0.01	0.0	1486.
20	9.60	32.641	20	25.202	278.1	9.60	277.5	0.56	0.06	0.0	1486.
30	9.60	32.645	30	25.205	278.0	9.60	277.2	0.84	0.13	0.0	1486.
49	8.89	32.665	49	25.333	266.1	8.88	264.9	1.36	0.34	0.0	1484.
74	6.08	32.747	74	25.789	222.7	6.07	221.6	1.98	0.73	0.0	1474.
99	4.66	32.807	98	26.001	202.6	4.65	201.5	2.49	1.18	0.0	1468.
124	4.20	33.042	123	26.235	180.5	4.19	179.2	2.97	1.73	6.21	1467.
148	4.09	33.420	147	26.546	151.2	4.08	149.6	3.37	2.28	4.46	1468.
173	3.95	33.683	172	26.769	130.2	3.94	128.4	3.73	2.86	2.82	1468.
197	3.87	33.752	196	26.832	124.4	3.86	122.5	4.03	3.43	2.47	1468.
247	3.85	33.855	245	26.916	116.9	3.83	114.5	4.62	4.78	1.76	1469.
297	3.78	33.912	295	26.968	112.3	3.76	109.5	5.20	6.38	1.53	1469.
396	3.67	34.038	393	27.079	102.5	3.64	98.9	6.26	10.12	1.02	1471.
497	3.57	34.121	493	27.155	96.0	3.54	91.7	7.26	14.67	1.04	1472.
600	3.41	34.187	595	27.223	90.2	3.37	85.2	8.22	20.03	0.99	1473.
805	3.10	34.300	798	27.342	79.9	3.05	73.8	9.96	32.49	1.11	1475.
1004	2.83	34.376	994	27.427	72.6	2.76	65.7	11.47	46.40	1.01	1477.
1202	2.58	34.440	1190	27.500	66.2	2.50	58.6	12.84	61.86	0.89	1480.
1498	2.32	34.499	1482	27.569	60.5	2.22	52.0	14.71	87.58	1.05	1484.
1993	1.94	34.577	1969	27.662	52.5	1.80	43.0	17.49	136.96	1.68	1490.
2493	1.73	34.620	2460	27.713	48.6	1.55	38.0	20.00	194.41	2.02	1498.


OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, O/OO
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
✳ - 71 - 7 - 2

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 7- 2 DATE 30/ 9/71
POSITION 50- 5.0 N, 145- 4.0 W GMT 20.0
HYDROGRAPHIC CAST DATA

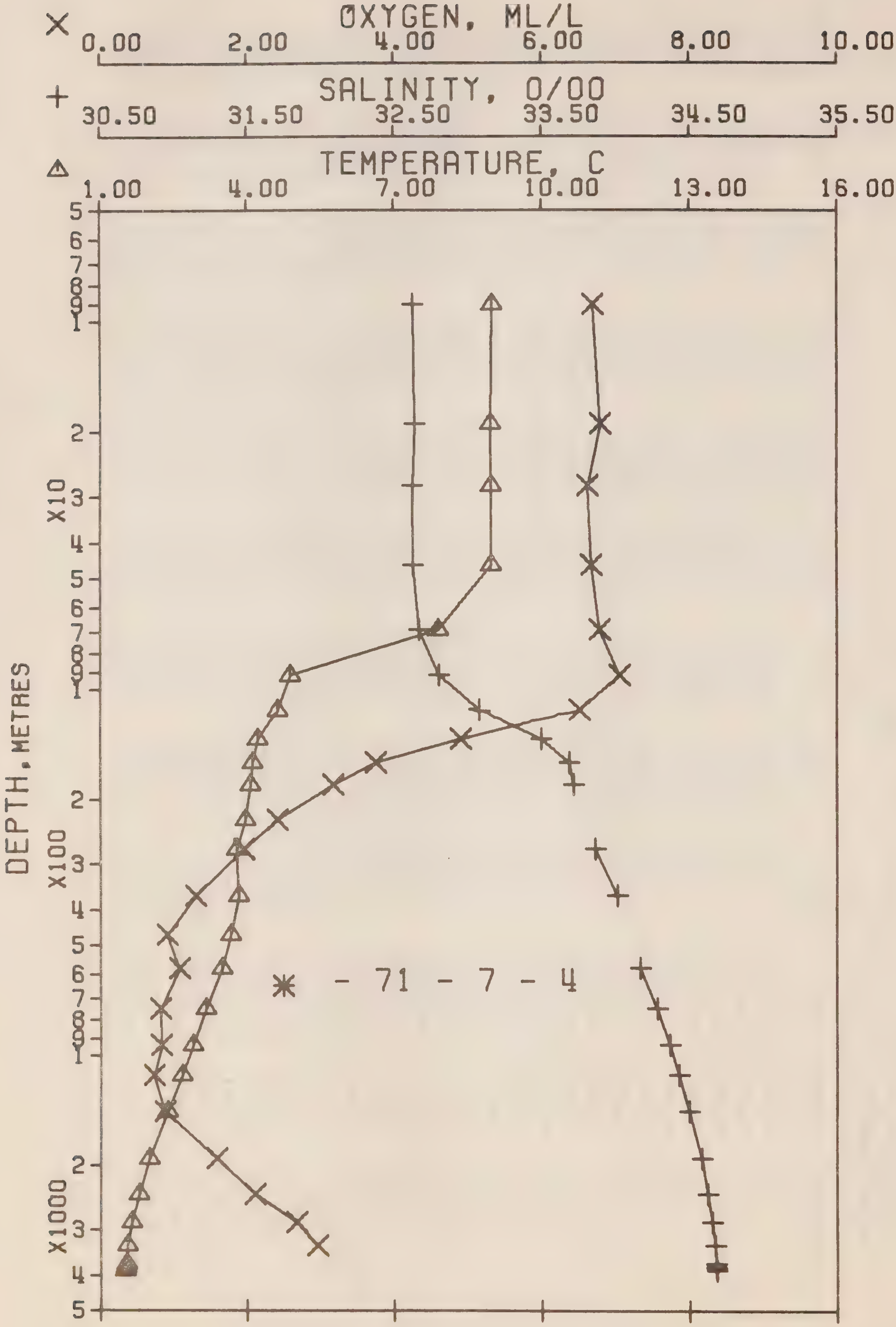
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	9.67	32.643	0	25.192	278.7	9.67	278.5	0.0	0.0	6.70	1486.
10	9.65	32.643	10	25.195	278.6	9.65	278.1	0.28	0.01	6.70	1486.
19	9.64	32.643	19	25.197	278.6	9.64	278.0	0.53	0.05	6.73	1486.
28	9.63	32.643	28	25.198	278.6	9.63	277.8	0.78	0.11	6.71	1486.
47	9.20	32.657	47	25.278	271.2	9.19	270.2	1.31	0.32	6.67	1485.
69	7.47	32.724	69	25.588	241.9	7.46	240.6	1.89	0.66	6.83	1479.
92	4.92	32.800	91	25.967	205.8	4.91	204.7	2.38	1.06	7.03	1469.
114	4.52	32.894	113	26.085	194.8	4.51	193.5	2.82	1.52	6.99	1468.
136	4.02	33.186	135	26.368	167.9	4.01	166.6	3.23	2.04	5.73	1467.
157	4.05	33.604	156	26.697	137.0	4.04	135.4	3.55	2.52	4.23	1468.
179	3.97	33.725	178	26.801	127.3	3.96	125.5	3.84	3.01	3.50	1468.
223	3.83	33.811	221	26.883	119.8	3.81	117.7	4.37	4.10	2.48	1468.
267	3.81	33.893	265	26.950	113.8	3.79	111.2	4.88	5.39	1.63	1469.
363	3.78	34.009	360	27.045	105.5	3.75	102.2	5.93	8.76	1.08	1471.
471	3.62	34.122	467	27.151	96.3	3.59	92.1	7.02	13.37	1.06	1472.



× OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
+ SALINITY, O/OO
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
✳ - 71 - 7 - 3

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 7- 3 DATE 4/10/71
POSITION 49-46.5 N, 144-59.0 W GMT 19.0
HYDROGRAPHIC CAST DATA

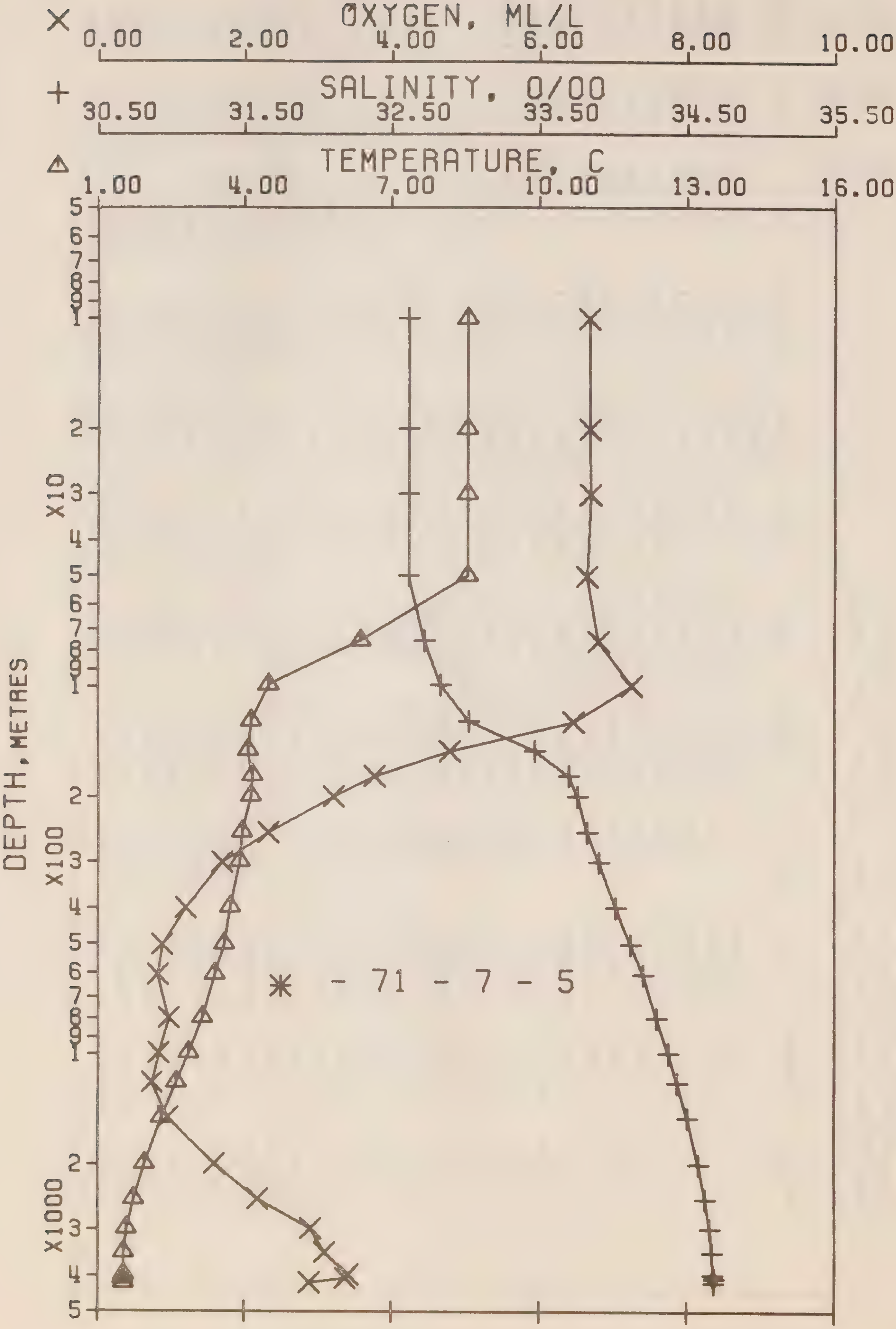
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	9.69	32.604	0	25.158	281.9	9.69	281.6	0.0	0.0	6.62	1486.
10	9.70	32.612	10	25.163	281.6	9.70	281.2	0.28	0.01	6.67	1486.
20	9.71	32.618	20	25.166	281.5	9.71	280.9	0.57	0.06	6.70	1487.
30	9.71	32.617	30	25.165	281.8	9.71	280.9	0.85	0.13	6.64	1487.
50	9.65	32.621	50	25.178	281.0	9.64	279.7	1.42	0.37	6.68	1487.
75	7.67	32.703	75	25.544	246.3	7.66	244.9	2.09	0.79	6.80	1480.
101	5.06	32.822	100	25.969	205.7	5.05	204.5	2.65	1.30	7.00	1470.
126	4.82	33.042	125	26.170	186.9	4.81	185.4	3.15	1.87	6.74	1470.
151	4.22	33.439	150	26.548	151.1	4.21	149.5	3.57	2.47	5.36	1468.
175	4.17	33.694	174	26.756	131.6	4.16	129.8	3.91	3.03	3.98	1469.
200	4.05	33.750	199	26.812	126.4	4.04	124.4	4.23	3.65	3.34	1469.
250	3.89	33.827	248	26.890	119.4	3.87	117.0	4.84	5.04	2.35	1469.
299	3.91	33.918	297	26.960	113.2	3.89	110.3	5.41	6.64	1.76	1470.
399	3.77	34.043	396	27.073	103.2	3.74	99.5	6.49	10.47	1.30	1471.
500	3.63	34.113	496	27.143	97.3	3.60	92.8	7.50	15.10	1.11	1472.
605	3.47	34.197	600	27.225	90.1	3.43	84.9	8.48	20.65	1.17	1473.
782	3.12	34.303	775	27.343	79.8	3.07	73.7	9.98	31.22	0.91	1475.
973	2.89	34.381*	964	27.426	72.8	2.82	65.8	11.43	44.22	0.90	1477.
1165	2.65	34.436	1153	27.491	67.1	2.57	59.5	12.77	58.78	0.87	1479.
1449	2.35	34.504	1434	27.571	60.3	2.25	51.9	14.58	82.88	0.95	1483.
1926	1.98	34.579	1903	27.661	52.5	1.85	43.2	17.24	128.71	1.59	1489.
2409	1.76	34.627	2378	27.716	48.1	1.59	37.7	19.66	182.16	2.15	1497.
2905	1.63	34.665	2864	27.756	45.3	1.42	33.6	21.96	244.50	2.71	1504.
3419	1.55	34.678	3367	27.772	44.7	1.29	31.7	24.26	318.72	3.19	1513.
3958	1.53	34.683*	3893	27.778	45.5	1.21	30.8	26.70	410.56	3.35	1522.
4069	1.51	34.687	4001	27.783	45.2	1.18	30.4	27.20	431.12	3.47	1524.
4182	1.53	34.696	4111	27.788	45.2	1.19	29.7	27.71	452.57	3.46	1526.



OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
✱ - 71 - 7 - 4

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 7- 4 DATE 14/10/71
POSITION 50- 3.0 N, 145- 1.0 W GMT 19.2
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	9.02	32.636	0	25.290	269.3	9.02	269.1	0.0	0.0	6.66	1484.
9	8.99	32.634	9	25.293	269.2	8.99	268.8	0.24	0.01	6.70	1484.
19	8.97	32.646	19	25.306	268.2	8.97	267.6	0.51	0.05	6.80	1484.
28	8.98	32.630	28	25.292	269.6	8.98	268.9	0.76	0.11	6.63	1484.
46	8.98	32.634	46	25.295	269.7	8.98	268.6	1.25	0.30	6.68	1484.
69	7.90	32.676	69	25.490	251.4	7.89	250.1	1.86	0.66	6.79	1481.
93	4.89	32.809	92	25.977	204.8	4.88	203.7	2.39	1.09	7.06	1469.
115	4.63	33.082	114	26.222	181.8	4.62	180.5	2.81	1.54	6.52	1469.
138	4.22	33.501	137	26.597	146.3	4.21	144.8	3.19	2.03	4.91	1468.
160	4.12	33.691	159	26.758	131.2	4.11	129.5	3.50	2.49	3.76	1468.
183	4.07	33.722	182	26.788	128.5	4.06	126.7	3.79	3.01	3.18	1468.
229	3.97	33.790*	227	26.852	122.8	3.95	120.6	4.37	4.21	2.42	1469.
275	3.79	33.863	273	26.928	115.9	3.77	113.3	4.92	5.63	1.96	1469.
370	3.83	34.013	367	27.044	105.8	3.80	102.3	5.97	9.07	1.30	1471.
473	3.67	34.104*	469	27.132	98.2	3.64	94.0	7.01	13.57	0.91	1472.
584	3.49	34.168	579	27.200	92.3	3.45	87.4	8.07	19.27	1.08	1473.
753	3.16	34.287	746	27.326	81.2	3.11	75.4	9.53	29.22	0.82	1475.
948	2.89	34.370	939	27.417	73.4	2.83	66.7	11.03	42.23	0.83	1477.
1146	2.66	34.430	1134	27.485	67.6	2.58	60.1	12.42	57.05	0.73	1479.
1444	2.36	34.502	1428	27.568	60.5	2.26	52.1	14.32	82.14	0.88	1483.
1942	1.99	34.583	1919	27.663	52.5	1.86	42.9	17.11	130.27	1.59	1490.
2434	1.78	34.626	2402	27.714	48.6	1.61	37.9	19.58	185.40	2.11	1497.
2912	1.63	34.656	2870	27.749	46.0	1.42	34.3	21.83	246.72	2.68	1505.
3366	1.54	34.677	3314	27.772	44.5	1.28	31.8	23.88	312.08	2.96	1512.
3787	1.52	34.680	3725	27.776	45.1	1.22	31.2	25.76	380.76	0.0	1519.
3867	1.51	34.680	3803	27.777	45.2	1.20	31.0	26.12	394.85	0.0	1520.
3943	1.49	34.683	3878	27.781	44.9	1.17	30.6	26.47	408.64	0.0	1522.



× ØXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
+ SALINITY, O/OO
30.50 31.50 32.50 33.50 34.50 35.50
△ TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
✱ - 71 - 7 - 5

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 7- 5 DATE 26/10/71
POSITION 50- 8.0 N, 145- 0.0 W GMT 19.1
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	8.57	32.623	0	25.349	263.7	8.57	263.5	0.0	0.0	6.71	1482.
10	8.54	32.622	10	25.353	263.5	8.54	263.1	0.27	0.01	6.68	1482.
20	8.55	32.620	20	25.350	263.9	8.55	263.4	0.53	0.05	6.69	1482.
30	8.54	32.621	30	25.352	263.9	8.54	263.1	0.80	0.12	6.70	1482.
50	8.54	32.621	50	25.352	264.3	8.53	263.1	1.33	0.34	6.65	1483.
75	6.37	32.731	75	25.740	227.4	6.36	226.2	1.95	0.74	6.81	1475.
100	4.50	32.838	99	26.042	198.6	4.49	197.5	2.47	1.20	7.26	1468.
125	4.13	33.032	124	26.234	180.5	4.12	179.3	2.94	1.75	6.47	1467.
150	4.07	33.475	149	26.592	146.8	4.06	145.3	3.36	2.32	4.80	1468.
175	4.17	33.703	174	26.763	131.0	4.16	129.1	3.70	2.89	3.78	1469.
199	4.13	33.764	198	26.815	126.2	4.12	124.1	4.01	3.48	3.22	1469.
250	3.95	33.829	248	26.885	119.8	3.93	117.4	4.63	4.90	2.33	1469.
300	3.91	33.910	298	26.954	113.7	3.89	110.9	5.22	6.55	1.70	1470.
401	3.72	34.023	398	27.063	104.1	3.69	100.5	6.31	10.47	1.20	1471.
503	3.60	34.125	499	27.155	96.1	3.56	91.6	7.33	15.17	0.88	1472.
608	3.40	34.210	603	27.242	88.4	3.36	83.4	8.30	20.65	0.82	1473.
799	3.15	34.298	792	27.336	80.6	3.10	74.4	9.91	32.18	0.97	1475.
1000	2.86	34.380	990	27.428	72.6	2.79	65.6	11.44	46.22	0.83	1478.
1199	2.61	34.442	1187	27.499	66.5	2.53	58.7	12.82	61.73	0.74	1480.
1499	2.31	34.510	1483	27.579	59.6	2.21	51.1	14.71	87.65	0.96	1484.
2001	1.96	34.587	1977	27.669	52.0	1.82	42.4	17.48	137.18	1.60	1491.
2506	1.73	34.629	2472	27.720	47.9	1.55	37.2	19.99	194.72	2.19	1498.
3012	1.59	34.659	2968	27.754	45.5	1.37	33.7	22.34	260.86	2.91	1506.
3522	1.53	34.675	3467	27.772	44.9	1.26	31.8	24.64	337.37	3.10	1515.
4038	1.52	34.682	3970	27.778	45.6	1.19	30.8	26.98	427.72	3.42	1523.
4142	1.51	34.689	4071	27.784	45.3	1.17	30.2	27.45	447.34	3.38	1525.
+ 4245	1.53	34.687	4172	27.781	46.0	1.18	30.4	27.92	467.56	2.89	1527.

SURFACE TEMPERATURE AND SALINITY OBSERVATIONS

(P-71-7)

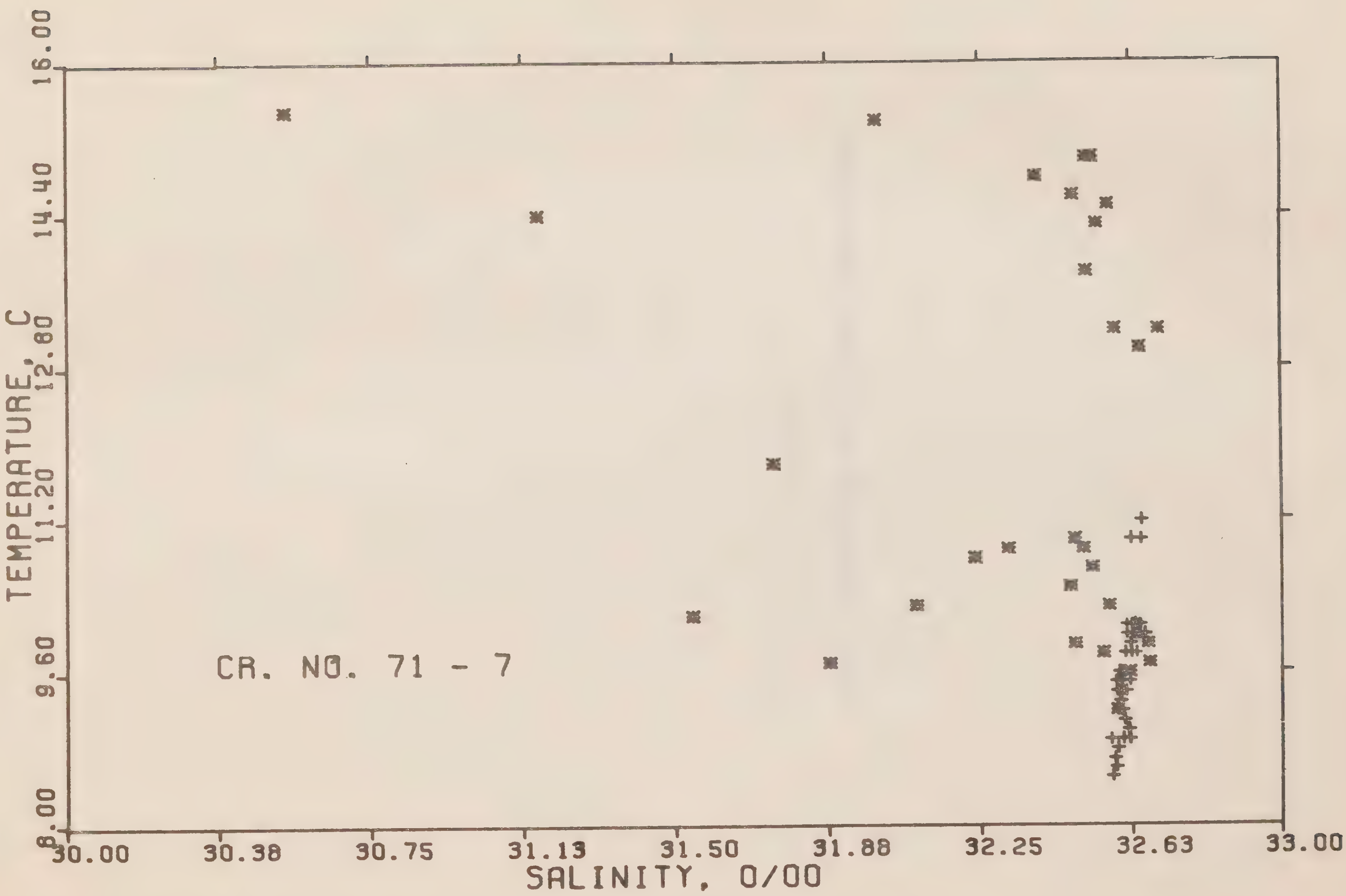


Fig. 13 T-S plot of surface temperature and salinity observations on Line P (asterisks) and at Station P (pluses) during Cruise P-71-7.

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 7

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	9	18	215	31.741	11.8	125-33
71	9	18	350	30.544	15.5	126- 0
71	9	18	545	31.164	14.4	126-40
71	9	18	810	31.998	15.4	127-40
71	9	18	1100	32.392	14.8	128-40
71	9	18	1405	32.517	15.0	129-40
71	9	18	1615	32.517	13.8	130-40
71	9	18	1845	32.543	14.3	131-40
71	9	18	2100	32.484	14.6	132-40
71	9	18	2330	32.531	15.0	133-40
71	9	19	210	32.570	14.5	134-40
71	9	19	500	32.586	13.2	135-40
71	9	19	800	32.648	13.0	136-40
71	9	19	1010	32.650	0.0	137-40
71	9	19	1240	32.694	13.2	138-40
71	9	19	1530	0.0	11.5	139-40
71	9	19	1745	32.647	13.0	140-40
71	9	19	2030	32.647	11.0	141-40
71	9	19	2330	32.649	11.2	142-40
71	9	20	230	32.624	11.0	143-40
71	9	21	0	32.632	10.1	ON STATION
71	9	22	0	32.656	10.0	ON STATION
71	9	23	0	32.625	10.1	ON STATION
71	9	24	0	32.627	10.0	ON STATION
71	9	25	0	32.631	10.0	ON STATION
71	9	26	0	32.643	10.0	ON STATION
71	9	27	0	32.636	10.0	ON STATION
71	9	28	0	32.636	10.0	ON STATION
71	9	29	0	32.637	10.0	ON STATION
71	9	30	0	32.641	10.1	ON STATION
71	10	1	0	32.646	10.1	ON STATION
71	10	2	0	32.643	10.0	ON STATION
71	10	3	0	32.611	10.1	ON STATION
71	10	4	0	32.612	10.0	ON STATION
71	10	5	0	32.624	9.8	ON STATION
71	10	6	0	32.637	9.8	ON STATION
71	10	7	0	32.621	9.9	ON STATION
71	10	8	0	32.609	9.8	ON STATION
71	10	9	0	32.593	9.6	ON STATION
71	10	10	0	32.599	9.6	ON STATION
71	10	11	0	32.598	9.5	ON STATION
71	10	12	0	32.619	9.5	ON STATION
71	10	13	0	32.588	9.4	ON STATION
71	10	14	0	32.595	9.3	ON STATION
71	10	15	0	32.610	9.4	ON STATION
71	10	16	0	32.591	9.4	ON STATION
71	10	17	0	32.586	9.5	ON STATION
71	10	18	0	32.601	9.4	ON STATION
71	10	19	0	32.587	9.4	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 7

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	10	19	0	32.587	9.4	ON STATION
71	10	20	0	32.590	9.2	ON STATION
71	10	21	0	32.597	9.2	ON STATION
71	10	22	0	32.597	9.3	ON STATION
71	10	23	0	32.620	8.9	ON STATION
71	10	24	0	32.617	8.9	ON STATION
71	10	25	0	32.603	8.9	ON STATION
71	10	26	0	32.615	9.0	ON STATION
71	10	27	0	32.617	9.0	ON STATION
71	10	28	0	32.590	8.8	ON STATION
71	10	29	0	32.573	8.9	ON STATION
71	10	30	0	32.582	8.7	ON STATION
71	10	31	0	32.577	8.5	ON STATION
71	11	1	0	32.586	8.6	ON STATION
71	11	1	1900	32.606	9.1	142-40
71	11	1	2110	32.600	9.2	141-40
71	11	1	2350	32.587	9.2	140-35
71	11	2	150	32.619	9.6	139-40
71	11	2	415	32.668	9.7	138-40
71	11	2	600	32.665	9.9	137-40
71	11	2	830	32.553	9.8	136-40
71	11	2	1053	32.485	9.9	135-40
71	11	2	1540	32.568	10.3	133-40
71	11	2	1800	32.474	10.5	132-40
71	11	2	2000	32.527	10.7	131-40
71	11	2	2215	32.505	10.9	130-40
71	11	3	45	32.485	11.0	129-41
71	11	3	245	32.237	10.8	128-40
71	11	3	500	32.320	10.9	127-40
71	11	3	735	32.092	10.3	126-40
71	11	3	910	31.544	10.2	126- 0
71	11	3	1011	31.878	9.7	125-33

OCEANOGRAPHIC DATA OBTAINED ON CRUISE P-71-8

(C.O.D.C. REFERENCE NO. 02-71-008)

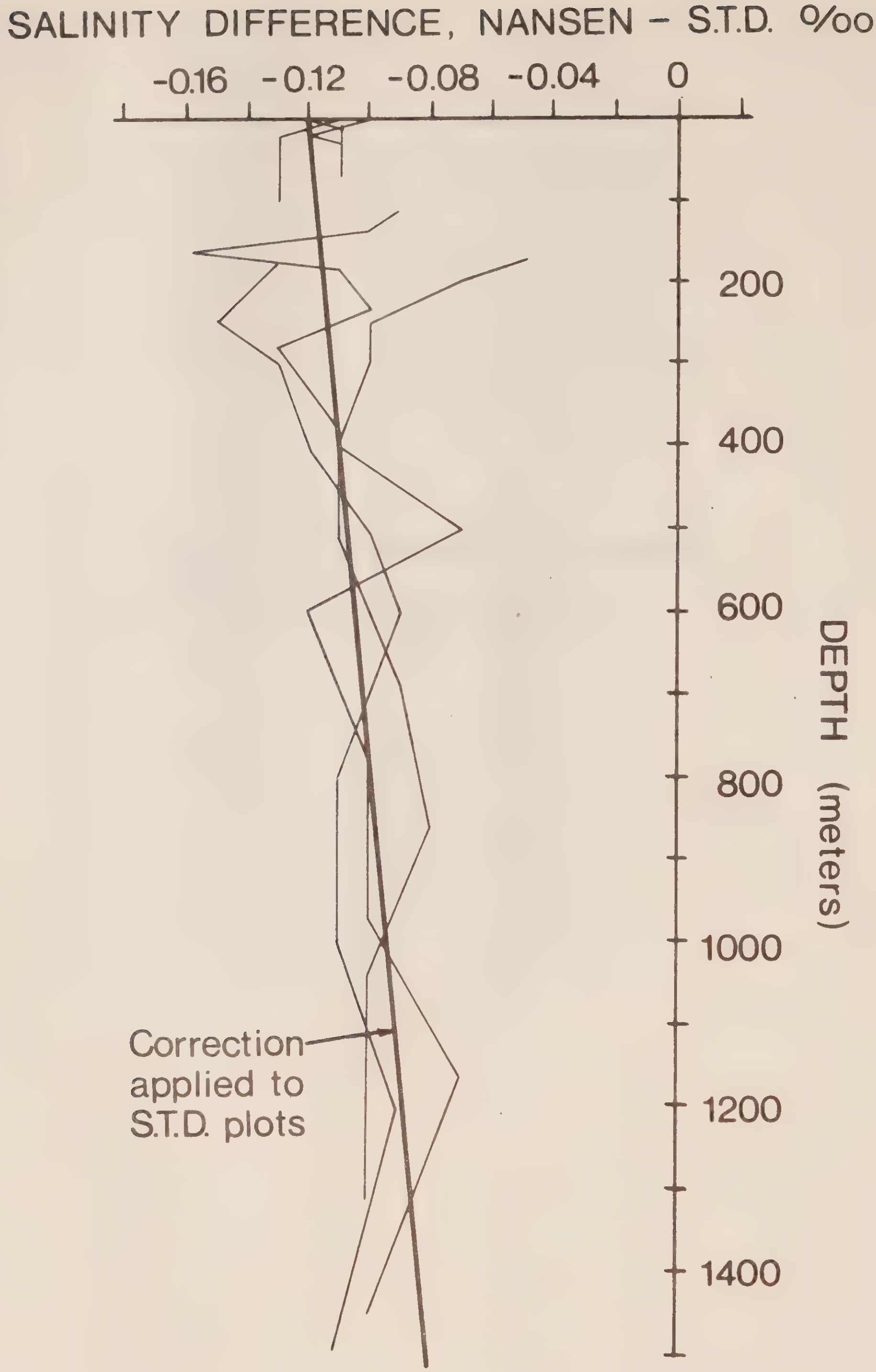


Fig. 14 Bottle - STD salinity value difference profiles P-71-8.

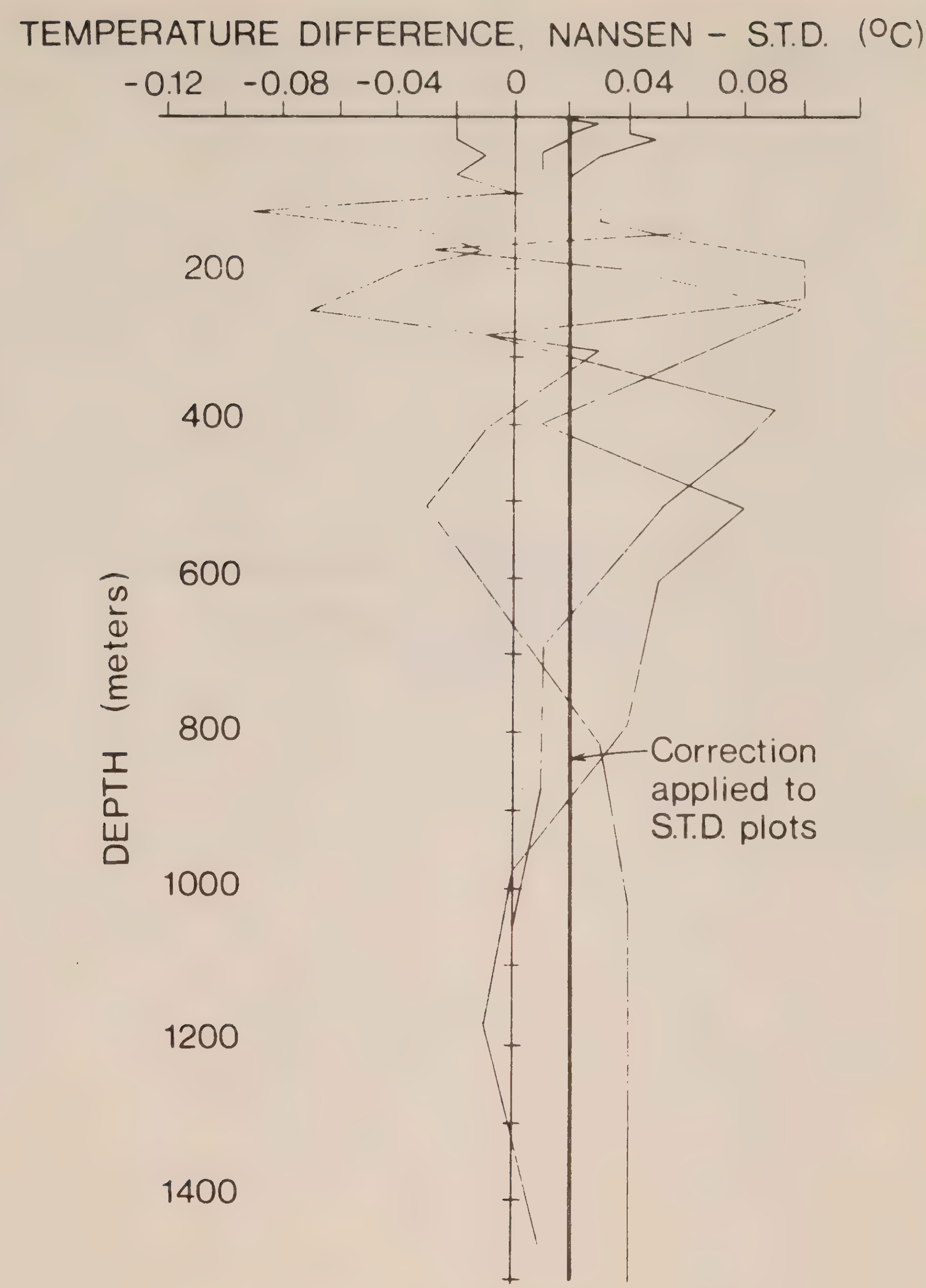


Fig. 15 Reversing thermometer - STD temperature difference profiles P-71-8.

COMPOSITE PLOTS OF TEMPERATURE, SALINITY

AND DISSOLVED OXYGEN VS DEPTH

(P-71-8)

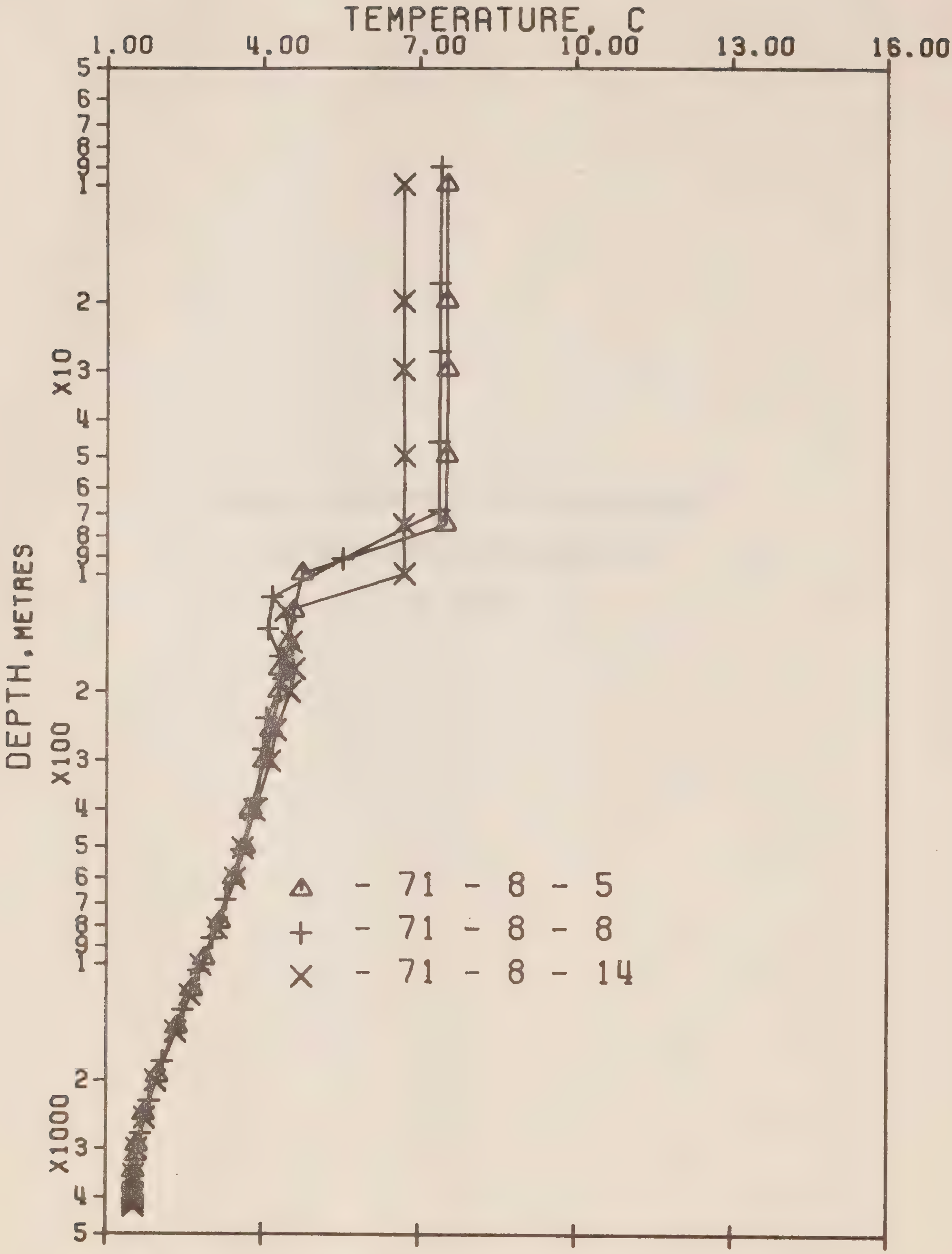


Fig. 16 Composite plot of temperature vs $\log_{10}$ depth P-71-8.

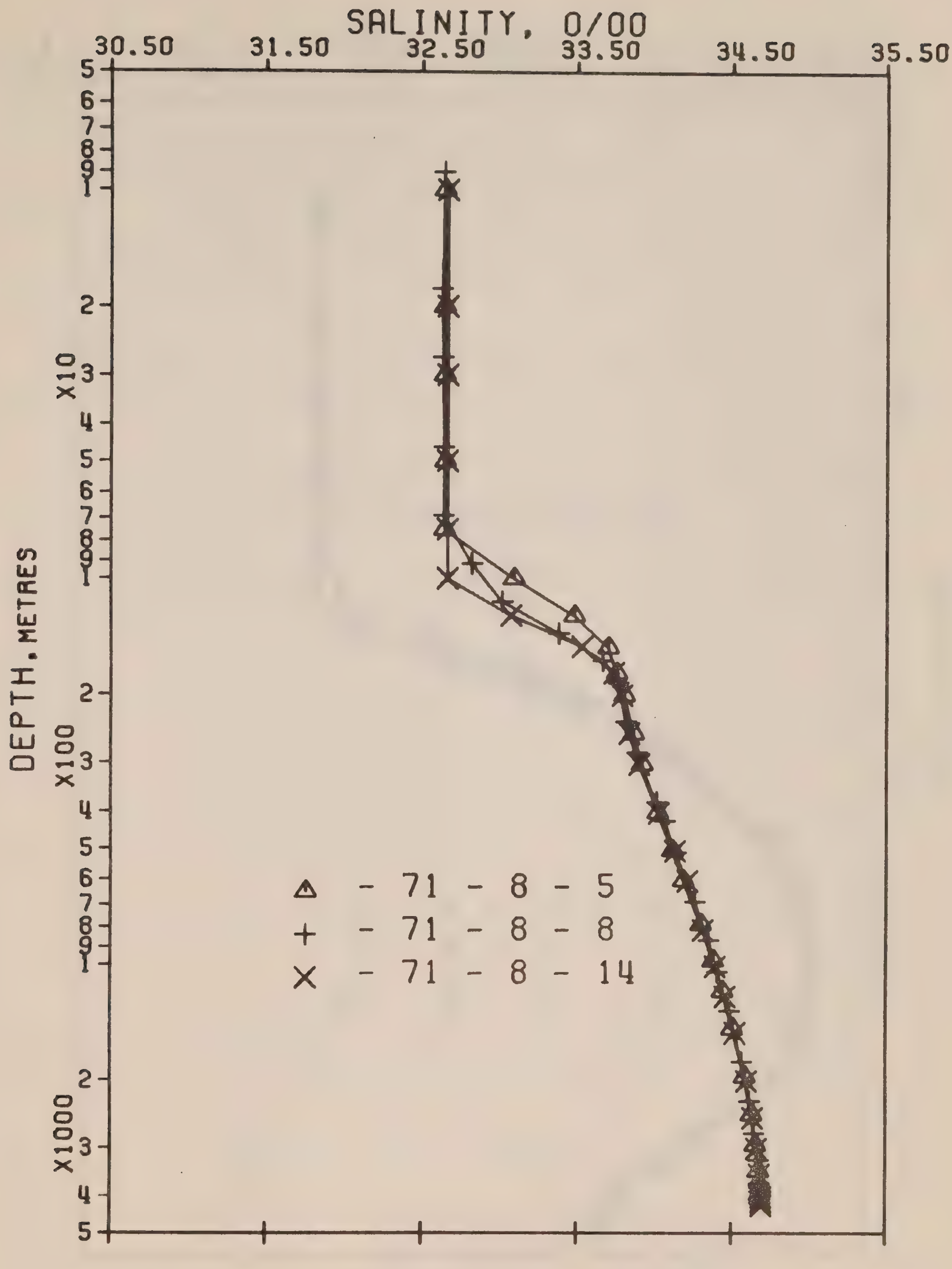


Fig. 17 Composite plot of salinity vs $\log_{10}$ depth P-71-8.

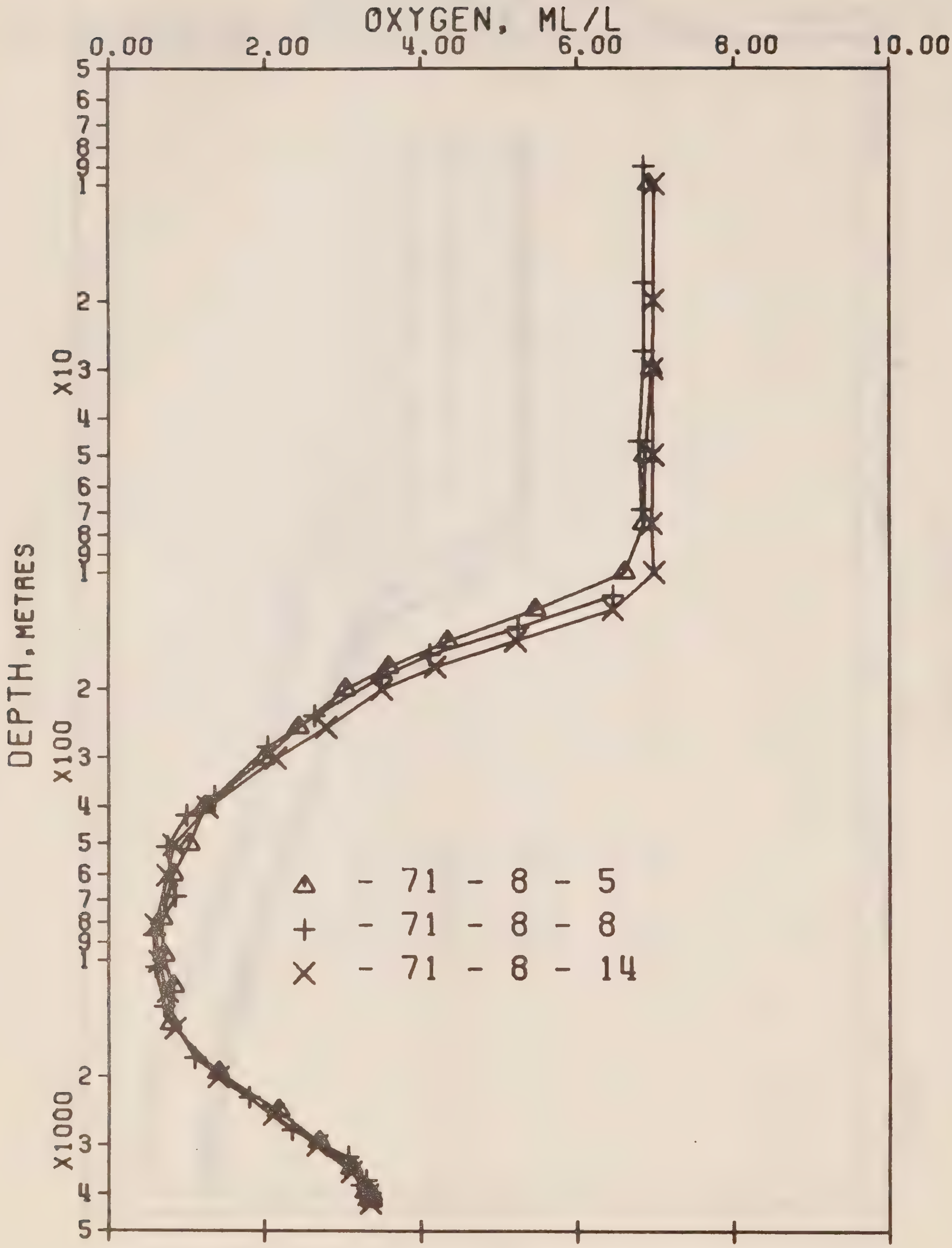
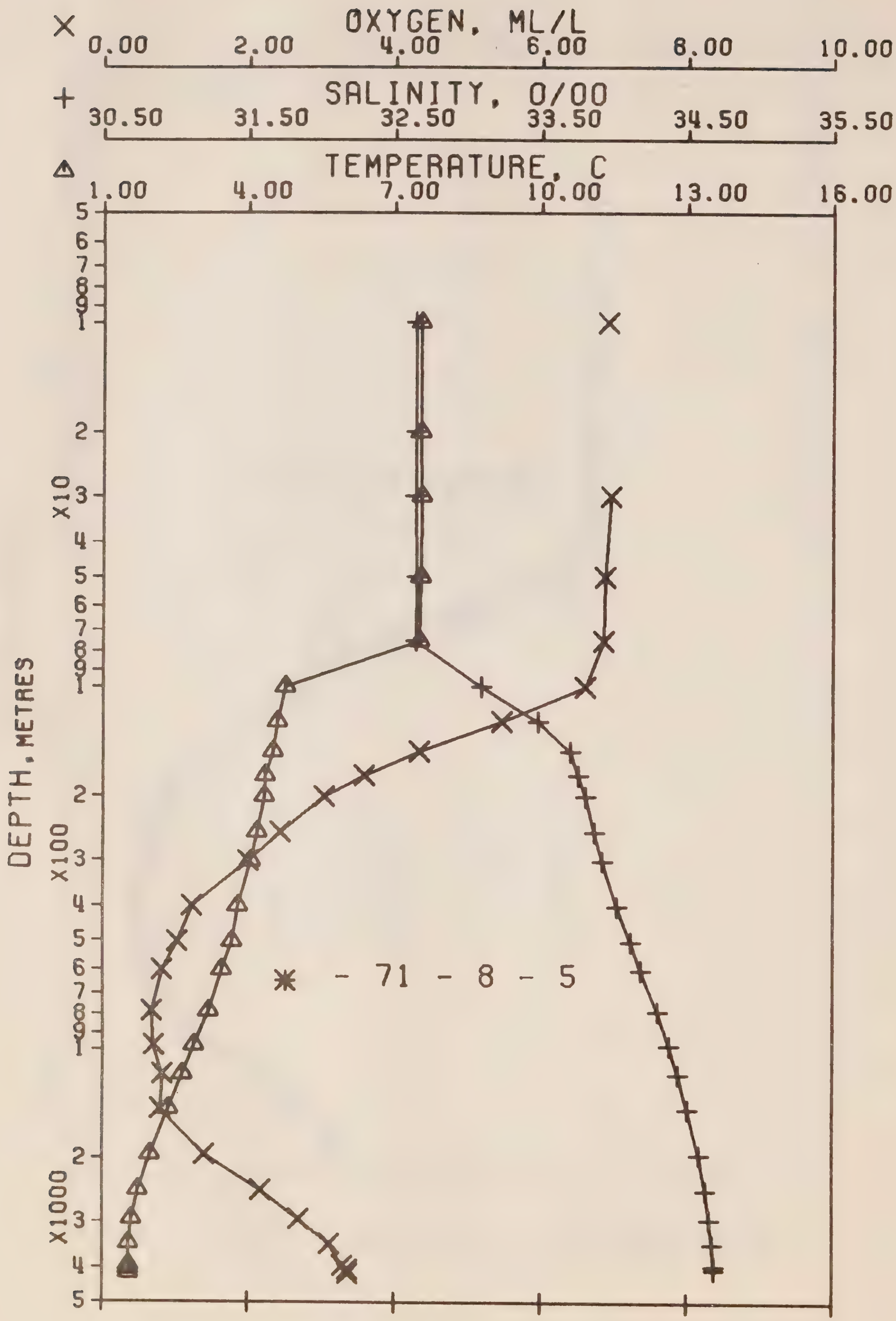


Fig. 18 Composite plot of oxygen vs log 10 depth P-71-8.

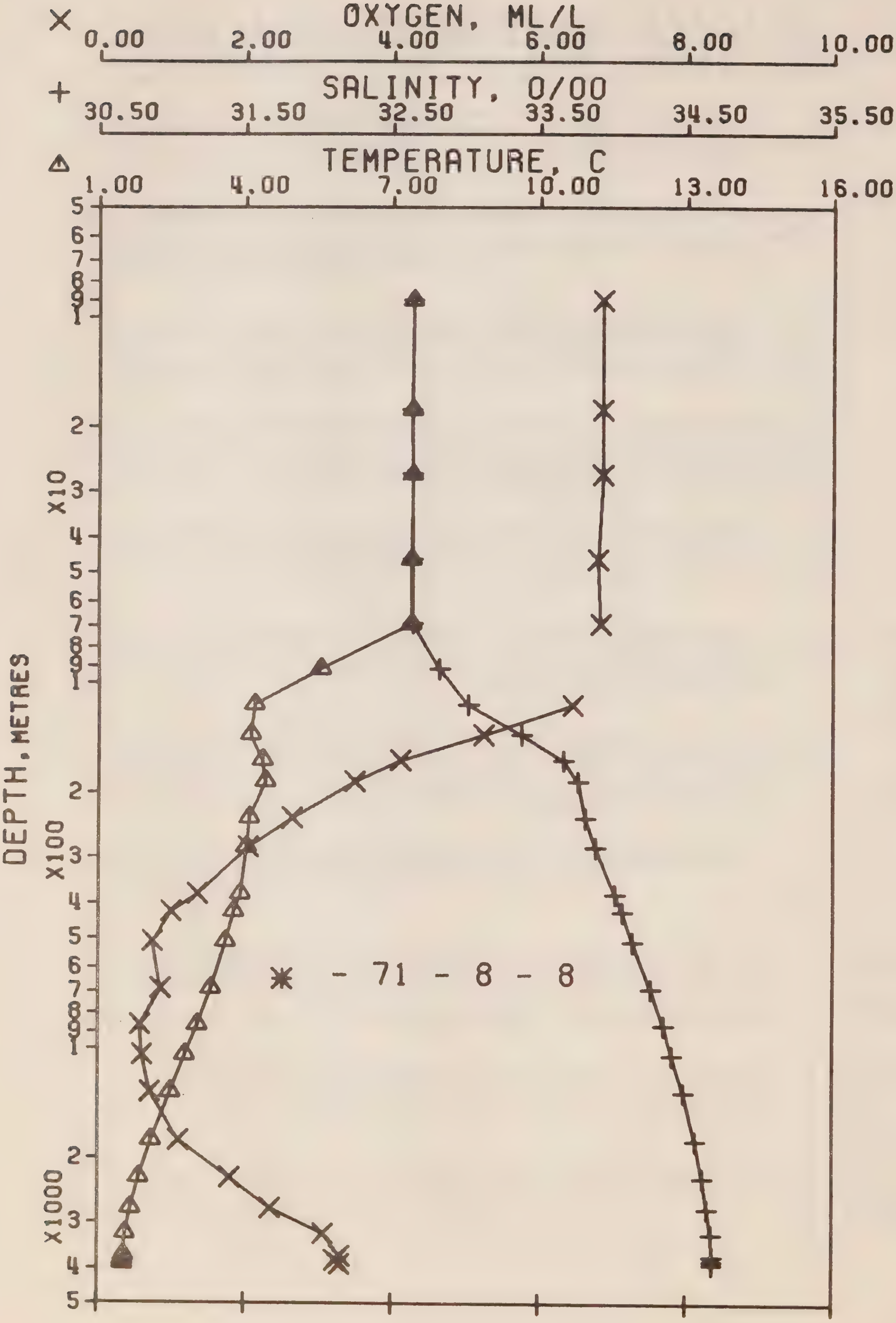
RESULTS OF BOTTLE CASTS

(P-71-8)


OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 8 - 5

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 5 DATE 10/11/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 18.0
HYDROGRAPHIC CAST DATA

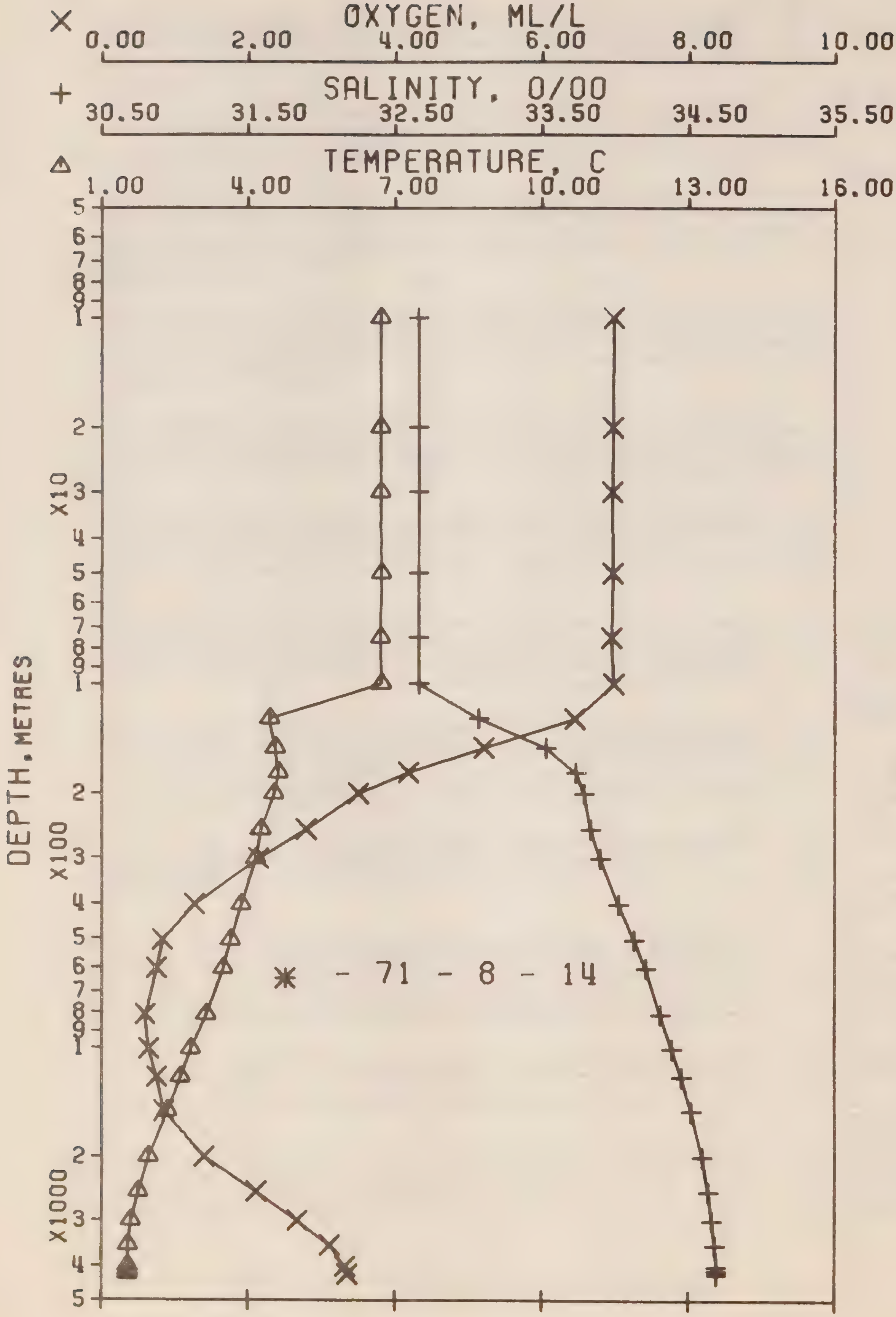
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	7.52	32.641	0	25.516	247.8	7.52	247.6	0.0	0.0	6.91	1478.
10	7.53	32.641	10	25.515	248.1	7.53	247.7	0.25	0.01	6.91	1478.
20	7.53	32.641	20	25.515	248.2	7.53	247.7	0.50	0.05	0.0	1478.
30	7.54	32.641	30	25.513	248.5	7.54	247.8	0.75	0.12	6.95	1479.
50	7.53	32.643	50	25.516	248.6	7.53	247.5	1.25	0.32	6.87	1479.
75	7.50	32.640	75	25.518	248.7	7.49	247.3	1.89	0.73	6.85	1479.
101	4.75	33.088	100	26.214	182.5	4.74	181.3	2.43	1.22	6.60	1469.
126	4.58	33.479	125	26.542	151.5	4.57	150.1	2.85	1.70	5.46	1469.
152	4.50	33.700	151	26.726	134.4	4.49	132.6	3.22	2.22	4.33	1470.
177	4.33	33.756	176	26.788	128.6	4.32	126.7	3.55	2.77	3.58	1469.
202	4.31	33.803	201	26.827	125.1	4.30	122.9	3.86	3.39	3.03	1470.
254	4.17	33.863	252	26.890	119.6	4.15	117.0	4.49	4.85	2.43	1470.
304	4.03	33.919	302	26.949	114.4	4.01	111.3	5.08	6.53	1.99	1470.
406	3.78	34.022	403	27.056	104.9	3.75	101.1	6.20	10.57	1.22	1471.
508	3.66	34.115	504	27.142	97.4	3.62	93.0	7.23	15.37	1.02	1473.
609	3.45	34.187	604	27.219	90.7	3.41	85.6	8.18	20.78	0.81	1473.
791	3.17	34.299	784	27.335	80.7	3.12	74.4	9.73	31.86	0.67	1475.
987	2.87	34.379	977	27.426	72.7	2.80	65.8	11.22	45.37	0.70	1477.
1182	2.64	34.439	1170	27.494	66.9	2.56	59.3	12.58	60.42	0.82	1480.
1479	2.35	34.506	1463	27.572	60.3	2.25	51.7	14.47	85.95	0.79	1483.
1978	1.97	34.584	1954	27.665	52.3	1.83	42.7	17.25	134.98	1.40	1490.
2482	1.72	34.629	2449	27.721	47.7	1.54	37.2	19.75	191.83	2.17	1498.
2991	1.58	34.656	2948	27.753	45.5	1.36	33.9	22.11	257.69	2.69	1506.
3505	1.53	34.675	3450	27.772	44.9	1.26	31.8	24.42	334.23	3.11	1514.
4019	1.52	34.685	3952	27.780	45.4	1.19	30.6	26.74	423.20	3.29	1523.
4123	1.52	34.687	4053	27.782	45.5	1.18	30.4	27.21	442.77	3.36	1525.
4227	1.52	34.689*	4154	27.783	45.6	1.17	30.2	27.68	462.88	3.36	1527.



OXYGEN, ML/L
0.00
2.00
4.00
6.00
8.00
10.00
SALINITY, 0/00
30.50
31.50
32.50
33.50
34.50
35.50
TEMPERATURE, C
1.00
4.00
7.00
10.00
13.00
16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 8 - 8

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 8 DATE 19/11/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 18.0
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	7.39	32.637	0	25.531	246.4	7.39	246.2	0.0	0.0	6.86	1477.
9	7.40	32.636	9	25.529	246.8	7.40	246.3	0.22	0.01	6.85	1478.
18	7.39	32.627	18	25.523	247.4	7.39	246.9	0.45	0.04	6.85	1478.
27	7.39	32.629	27	25.525	247.4	7.39	246.7	0.67	0.09	6.85	1478.
46	7.38	32.634	46	25.530	247.1	7.38	246.3	1.14	0.27	6.79	1478.
69	7.38	32.633	69	25.529	247.5	7.37	246.3	1.72	0.61	6.83	1479.
93	5.53	32.821	92	25.914	211.0	5.52	209.7	2.26	1.05	0.0	1472.
116	4.18	33.014	115	26.215	182.3	4.17	181.1	2.71	1.53	6.45	1467.
140	4.10	33.379	139	26.513	154.3	4.09	152.9	3.12	2.06	5.24	1467.
164	4.34	33.665	163	26.715	135.4	4.33	133.7	3.46	2.60	4.11	1469.
188	4.40	33.766	187	26.789	128.7	4.39	126.6	3.78	3.17	3.49	1470.
237	4.07	33.816	235	26.863	122.0	4.05	119.6	4.38	4.48	2.64	1469.
285	4.01	33.883	283	26.922	116.7	3.99	113.9	4.96	6.01	2.04	1470.
382	3.89	34.014	379	27.038	106.5	3.86	102.8	6.04	9.69	1.35	1471.
426	3.76	34.064	423	27.091	101.7	3.73	97.8	6.50	11.59	0.99	1472.
515	3.60	34.134	511	27.163	95.5	3.56	91.0	7.38	15.79	0.74	1472.
693	3.30	34.259	687	27.291	84.3	3.25	78.7	8.97	25.60	0.85	1474.
874	3.02	34.350	866.	27.389	75.8	2.96	69.3	10.42	37.13	0.57	1476.
1057	2.77	34.405	1047	27.456	70.1	2.70	63.0	11.75	50.26	0.60	1478.
1336	2.47	34.485	1322	27.545	62.4	2.38	54.3	13.59	72.71	0.71	1482.
1809	2.08	34.567	1788	27.643	54.2	1.96	44.8	16.32	116.52	1.10	1488.
2293	1.82	34.617	2263	27.703	49.2	1.66	39.0	18.80	168.37	1.80	1495.
2782	1.66	34.644	2743	27.737	46.8	1.46	35.5	21.14	228.95	2.35	1503.
3276	1.55	34.675	3226	27.770	44.5	1.30	32.1	23.38	298.13	3.07	1510.
3772	1.52	34.680	3711	27.776	45.1	1.22	31.2	25.60	377.80	3.30	1519.
3871	1.51	34.680	3807	27.777	45.2	1.20	31.0	26.04	395.10	3.23	1520.
3970	1.51	34.681	3904	27.778	45.4	1.19	30.9	26.49	413.10	3.30	1522.

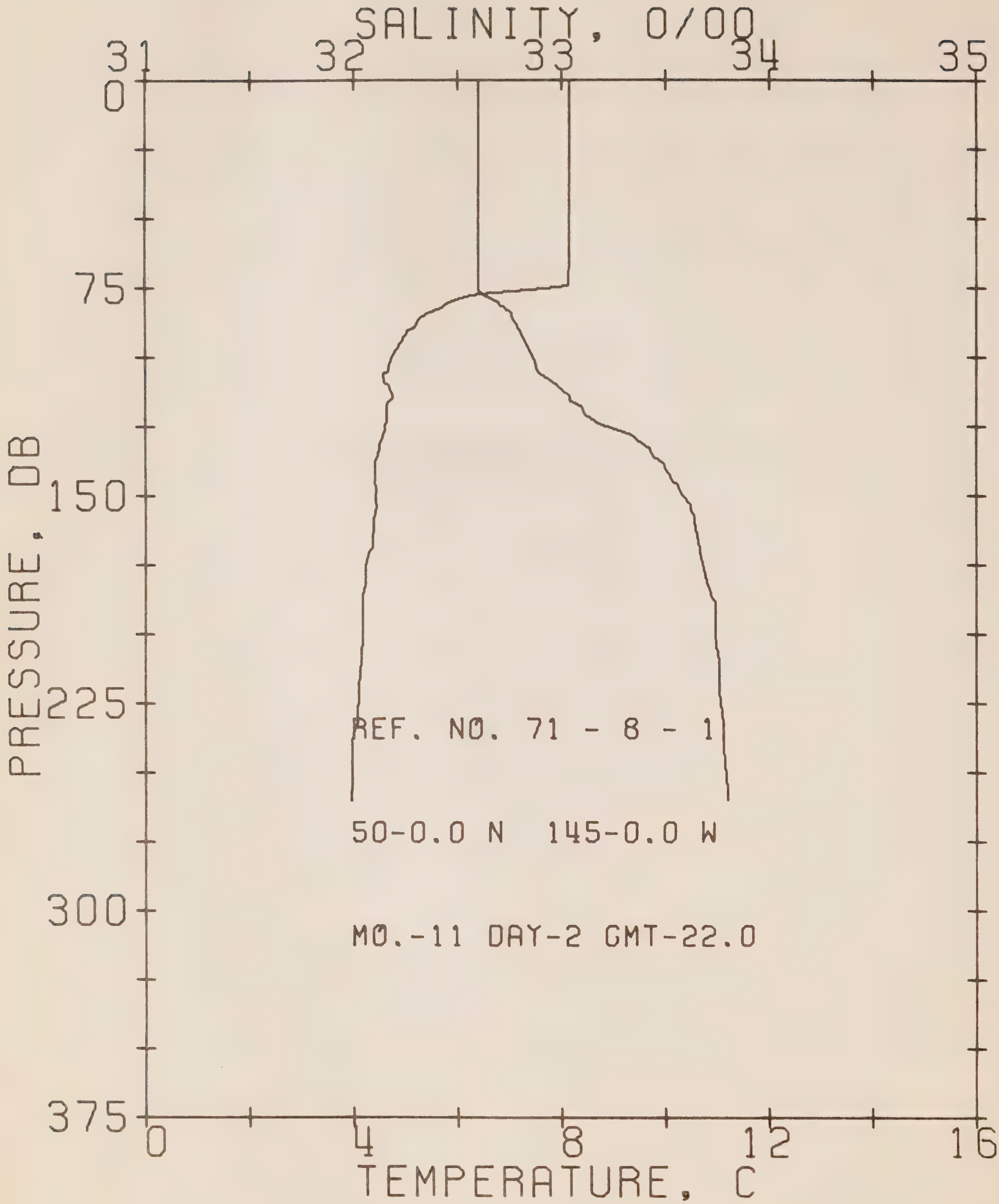

OXYGEN, ML/L
0.00 2.00 4.00 6.00 8.00 10.00
SALINITY, 0/00
30.50 31.50 32.50 33.50 34.50 35.50
TEMPERATURE, C
1.00 4.00 7.00 10.00 13.00 16.00
DEPTH, METRES
X10
X100
X1000
* - 71 - 8 - 14

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 14 DATE 2/12/71
POSITION 50- 0.0 N, 145- 0.0 W GMT 17.7
HYDROGRAPHIC CAST DATA

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	THETA	SVA (THETA)	DELTA D	POT. EN	OXY	SOUND
0	6.70	32.669	0	25.649	235.2	6.70	235.0	0.0	0.0	6.99	1475.
10	6.70	32.660	10	25.642	236.0	6.70	235.6	0.24	0.01	6.98	1475.
20	6.70	32.659	20	25.641	236.2	6.70	235.7	0.47	0.05	6.97	1475.
30	6.70	32.659	30	25.641	236.3	6.70	235.6	0.71	0.11	6.96	1475.
50	6.71	32.658	50	25.639	236.8	6.71	235.8	1.19	0.31	6.97	1476.
75	6.70	32.662	75	25.644	236.6	6.69	235.4	1.78	0.69	6.95	1476.
101	6.72	32.661	100	25.640	237.3	6.71	235.7	2.39	1.23	6.98	1477.
126	4.43	33.072	125	26.235	180.5	4.42	179.2	2.92	1.84	6.45	1468.
151	4.56	33.531	150	26.585	147.7	4.55	146.0	3.33	2.42	5.21	1470.
177	4.62	33.737	176	26.742	133.2	4.61	131.1	3.69	3.02	4.18	1471.
202	4.52	33.792	201	26.796	128.2	4.50	125.9	4.02	3.66	3.50	1471.
254	4.25	33.833	252	26.858	122.7	4.23	120.0	4.66	5.16	2.79	1470.
305	4.15	33.898	303	26.920	117.2	4.13	114.1	5.28	6.91	2.14	1471.
408	3.85	34.025	405	27.051	105.4	3.82	101.6	6.42	11.07	1.26	1472.
510	3.62	34.130	506	27.157	96.0	3.58	91.4	7.45	15.87	0.82	1472.
611	3.47	34.211	606	27.236	89.1	3.43	83.9	8.38	21.20	0.74	1474.
821	3.13	34.308	813	27.346	79.7	3.07	73.5	10.14	34.03	0.59	1476.
1020	2.82	34.388	1010	27.438	71.7	2.75	64.7	11.64	48.15	0.64	1478.
1221	2.61	34.455	1208	27.510	65.6	2.53	57.7	13.02	63.84	0.75	1480.
1523	2.33	34.521	1506	27.586	59.2	2.23	50.4	14.89	90.09	0.85	1484.
2031	1.95	34.594	2006	27.675	51.5	1.81	41.8	17.68	140.56	1.40	1491.
2543	1.73	34.637	2509	27.726	47.4	1.55	36.6	20.20	199.24	2.11	1499.
3060	1.59	34.661	3015	27.756	45.4	1.36	33.5	22.58	267.46	2.67	1507.
3579	1.53	34.682	3522	27.777	44.6	1.25	31.2	24.91	346.16	3.11	1516.
4099	1.52	34.692	4030	27.786	45.1	1.19	30.0	27.24	437.25	3.32	1524.
4203	1.52	34.692	4131	27.786	45.4	1.17	29.9	27.71	457.10	0.0	1526.
4308	1.53	34.689	4233	27.783	46.0	1.17	30.2	28.19	477.86	3.35	1528.

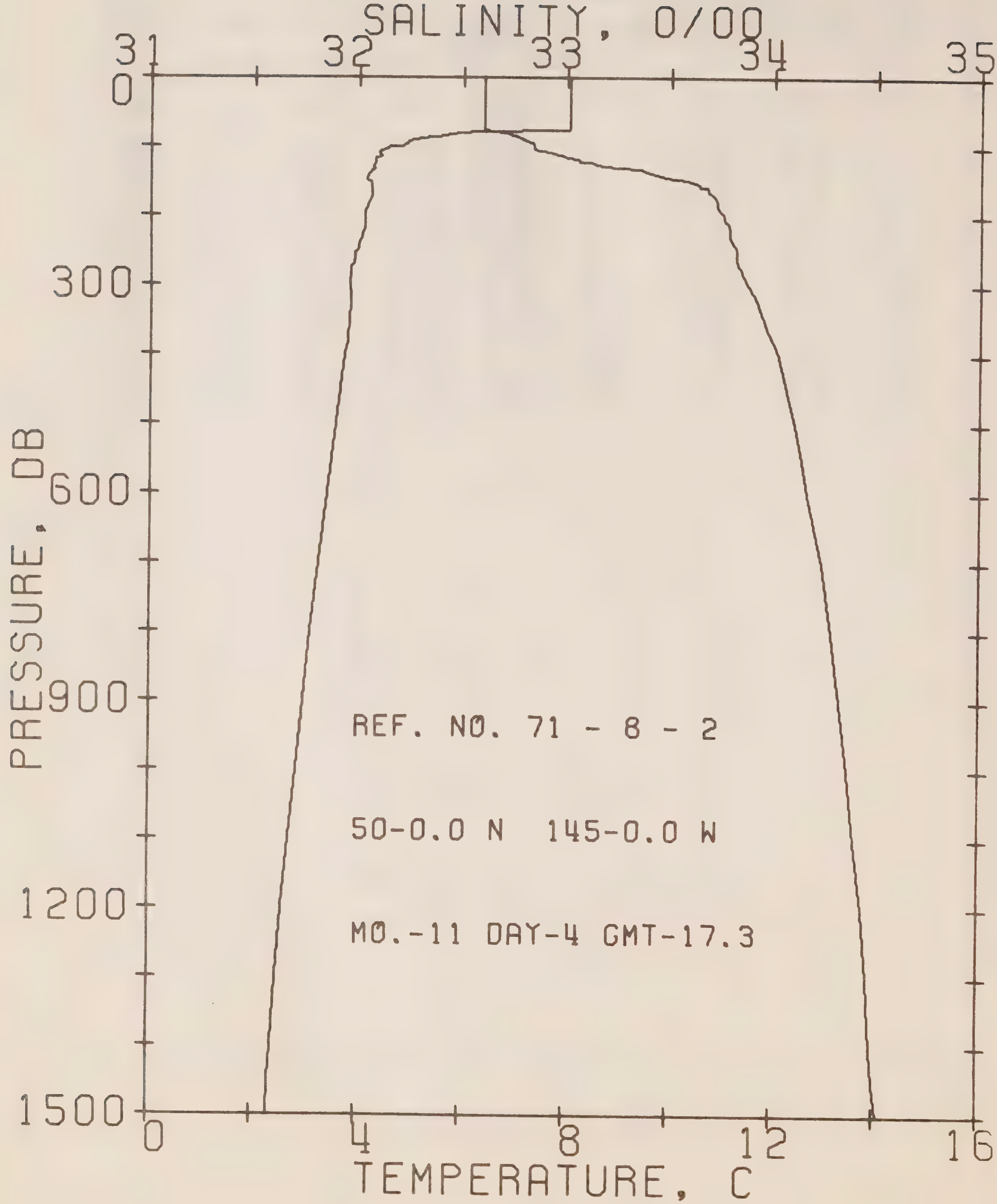
RESULTS OF STD CASTS

(P-71-8)


SALINITY, 0/00
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 8 - 1
50-0.0 N 145-0.0 W
MO.-11 DAY-2 GMT-22.0
0
4
8
12
16
TEMPERATURE, C

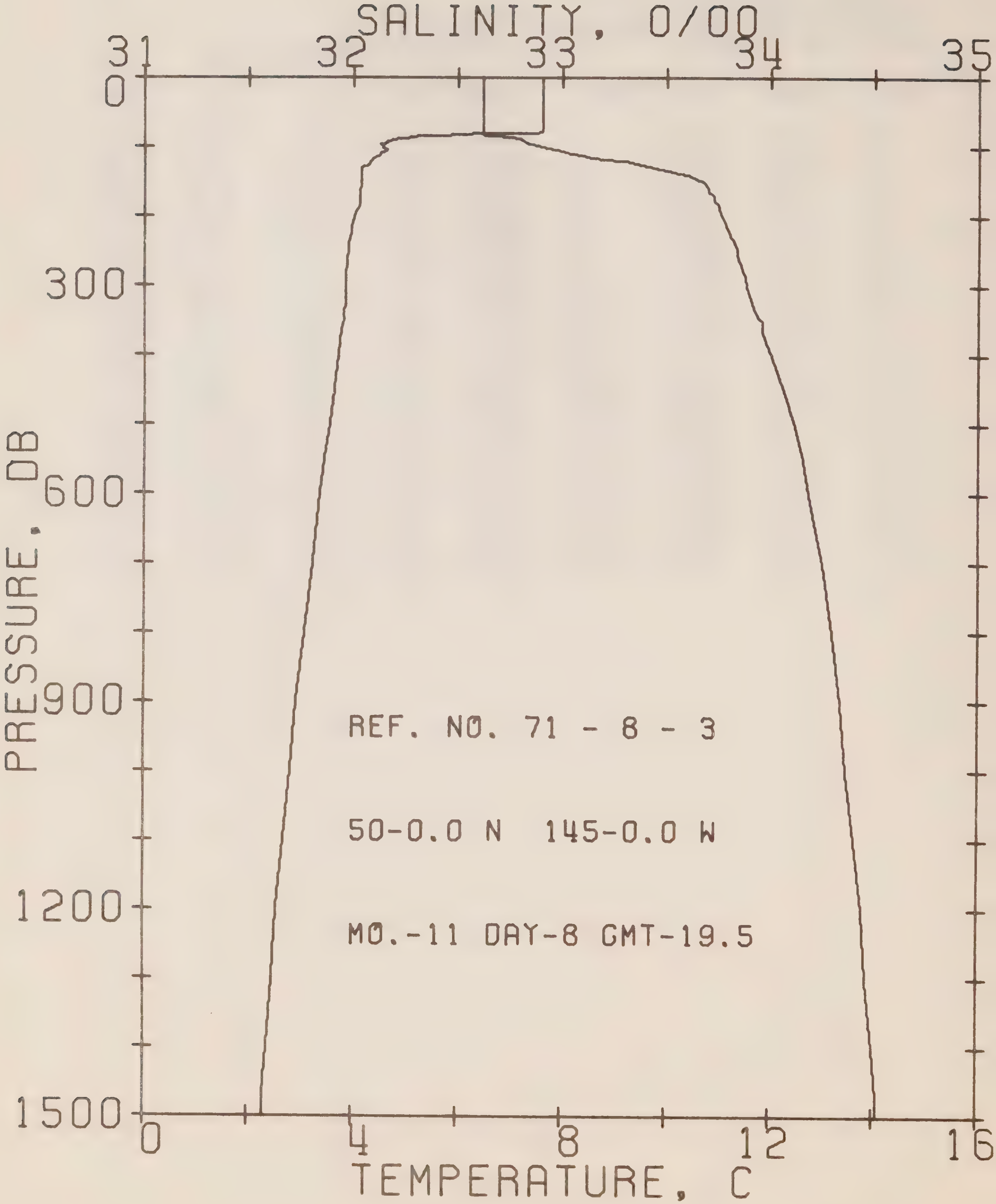
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 1 DATE 2/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 22.0
RESULTS OF STP CAST 70 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.16	32.60	0	25.39	259.4	0.0	0.0	1480.
10	8.16	32.60	10	25.39	259.8	0.26	0.01	1481.
20	8.16	32.60	20	25.39	259.9	0.52	0.05	1481.
30	8.16	32.60	30	25.39	260.2	0.78	0.12	1481.
50	8.17	32.60	50	25.39	260.5	1.30	0.33	1481.
75	7.67	32.60	75	25.46	254.0	1.95	0.75	1480.
100	4.75	32.87	99	26.04	198.8	2.49	1.22	1469.
125	4.60	33.22	124	26.33	171.2	2.96	1.76	1469.
150	4.43	33.59	149	26.65	141.8	3.34	2.29	1469.
175	4.26	33.69	174	26.74	133.1	3.68	2.86	1469.
200	4.18	33.74	199	26.79	128.5	4.00	3.48	1469.
225	4.09	33.77	223	26.82	125.6	4.32	4.16	1469.
250	3.97	33.79	248	26.86	122.6	4.63	4.91	1469.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 2
50-0.0 N 145-0.0 W
MO.-11 DAY-4 GMT-17.3
0
4
8
12
16
TEMPERATURE, C

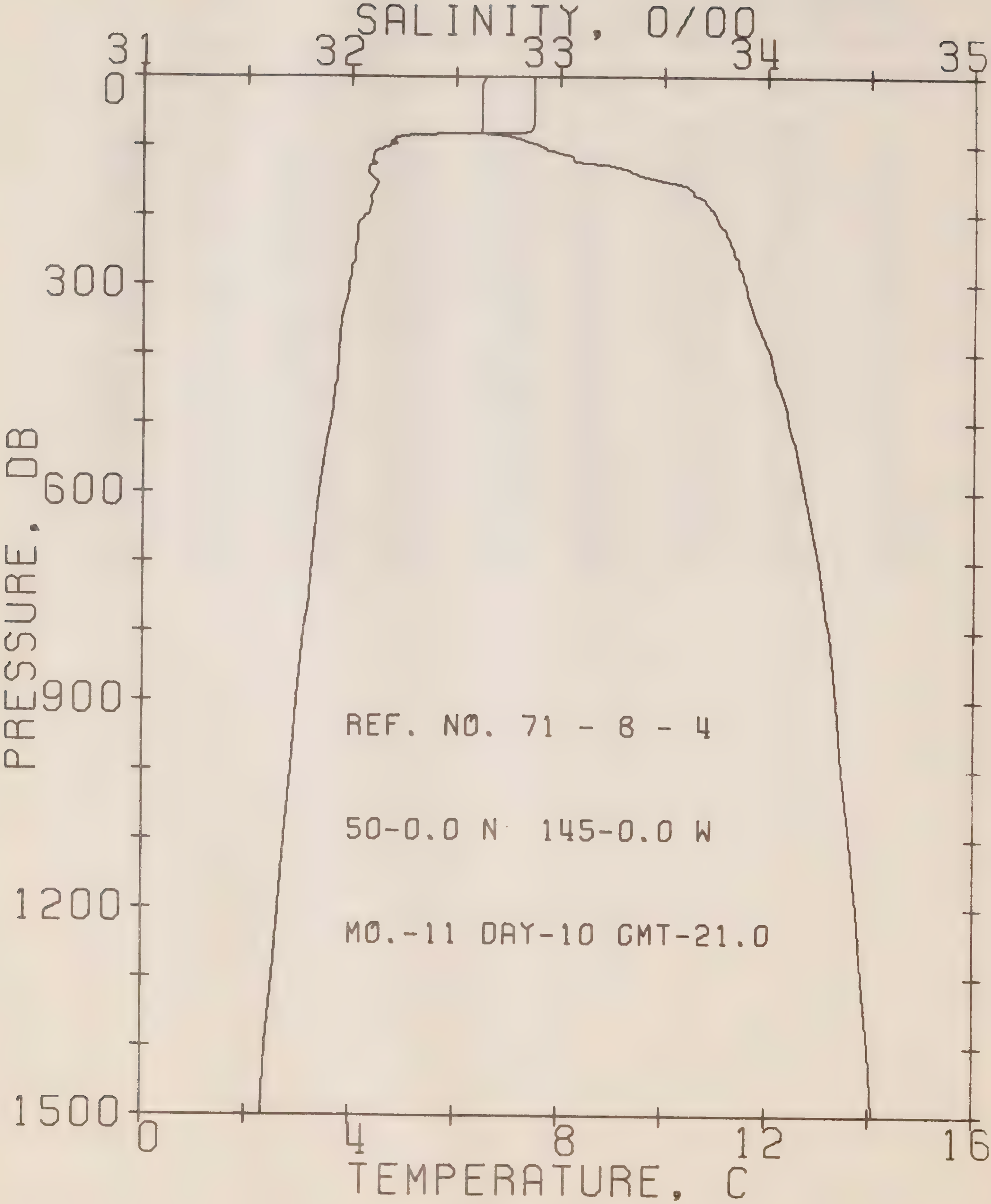
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 2 DATE 4/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 17.3
RESULTS OF STP CAST 93 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.04	32.60	0	25.41	257.7	0.0	0.0	1480.
10	8.04	32.60	10	25.41	258.1	0.26	0.01	1480.
20	8.05	32.60	20	25.41	258.3	0.52	0.05	1480.
30	8.04	32.60	30	25.41	258.4	0.77	0.12	1480.
50	8.05	32.60	50	25.41	258.8	1.29	0.33	1481.
75	8.05	32.60	75	25.41	259.2	1.94	0.74	1481.
100	4.85	32.84	99	26.01	202.1	2.48	1.22	1469.
125	4.32	33.13	124	26.30	174.8	2.95	1.76	1468.
150	4.21	33.60	149	26.68	138.9	3.34	2.30	1468.
175	4.25	33.72	174	26.77	130.3	3.68	2.86	1469.
200	4.12	33.76	199	26.81	126.4	4.00	3.47	1469.
225	4.09	33.79	223	26.84	124.0	4.31	4.15	1469.
250	3.99	33.82	248	26.87	120.9	4.62	4.89	1469.
300	3.85	33.88	298	26.94	115.4	5.21	6.55	1470.
400	3.77	34.03	397	27.06	104.2	6.31	10.46	1471.
500	3.59	34.11	496	27.14	97.0	7.31	15.07	1472.
600	3.44	34.17	595	27.21	91.8	8.26	20.35	1473.
800	3.13	34.29	793	27.33	80.9	9.98	32.56	1475.
1000	2.85	34.37	990	27.42	73.3	11.52	46.67	1478.
1200	2.58	34.44	1188	27.50	66.2	12.92	62.31	1480.
1500	2.31	34.52	1484	27.59	58.9	14.80	88.10	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 3
50-0.0 N 145-0.0 W
MO.-11 DAY-8 GMT-19.5
0
4
8
12
16
TEMPERATURE, C

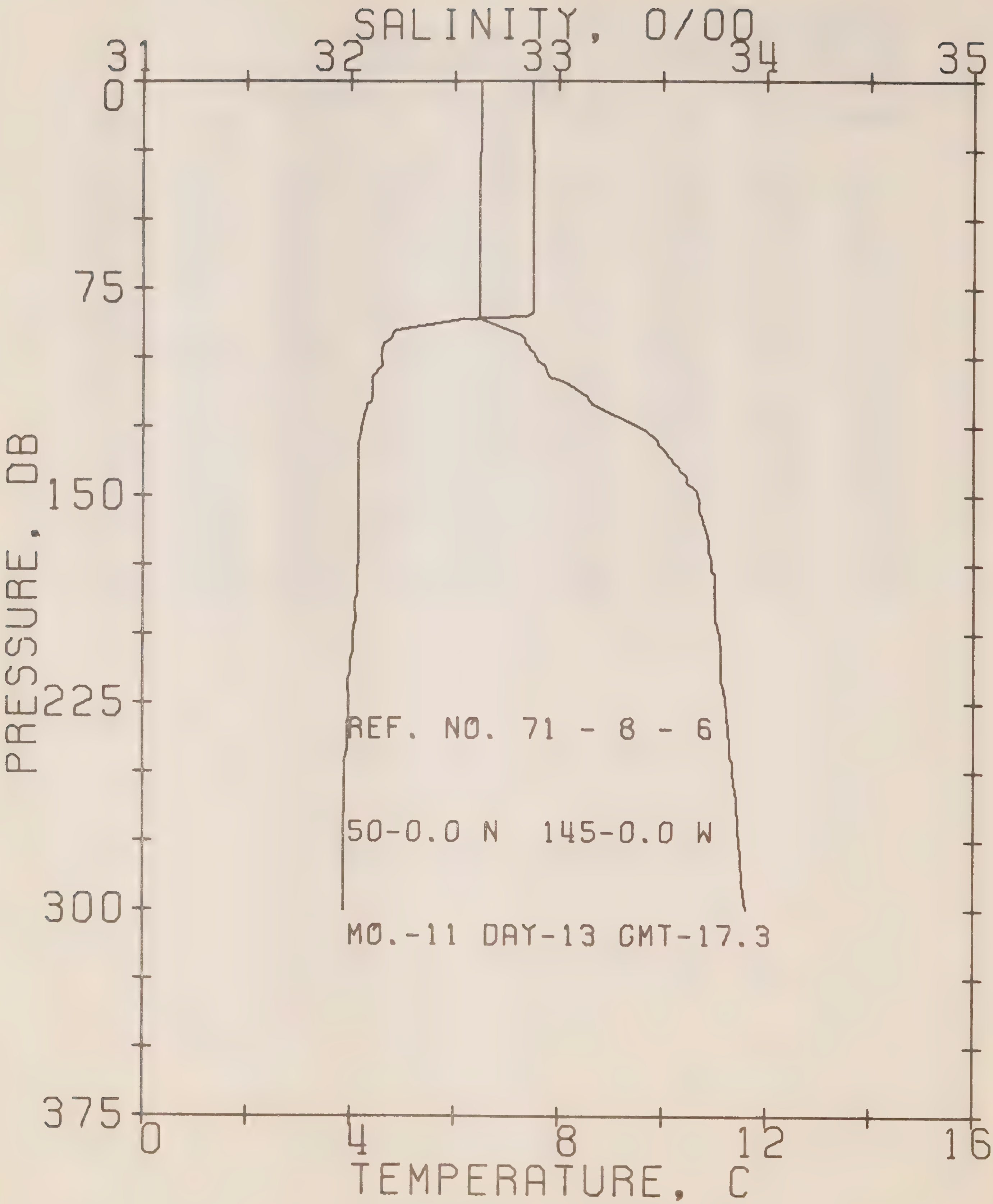
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 3 DATE 8/11/71
POSITICN 50- 0.0N, 145- 0.0W GMT 19.5
RESULTS OF STP CAST 83 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.62	32.62	0	25.49	250.5	0.0	0.0	1478.
10	7.62	32.62	10	25.49	250.9	0.25	0.01	1479.
20	7.62	32.62	20	25.49	251.0	0.50	0.05	1479.
30	7.62	32.62	30	25.49	251.2	0.75	0.12	1479.
50	7.62	32.62	50	25.49	251.5	1.26	0.32	1479.
75	7.62	32.62	75	25.49	251.8	1.88	0.72	1480.
100	4.57	32.90	99	26.08	194.7	2.43	1.20	1468.
125	4.32	33.36	124	26.48	157.7	2.87	1.71	1468.
150	4.17	33.68	149	26.74	132.5	3.23	2.21	1468.
175	4.14	33.73	174	26.79	128.6	3.56	2.75	1469.
200	4.04	33.77	199	26.83	124.8	3.88	3.36	1469.
225	3.97	33.81	223	26.87	121.3	4.18	4.02	1469.
250	3.92	33.84	248	26.90	118.7	4.48	4.75	1469.
300	3.87	33.89	298	26.94	114.9	5.07	6.38	1470.
400	3.73	34.01	397	27.05	105.2	6.17	10.31	1471.
500	3.57	34.12	496	27.15	96.1	7.17	14.91	1472.
600	3.40	34.19	595	27.23	89.8	8.10	20.10	1473.
800	3.10	34.30	793	27.34	79.9	9.80	32.14	1475.
1000	2.82	34.37	990	27.42	72.9	11.32	46.07	1477.
1200	2.57	34.45	1188	27.51	65.4	12.70	61.56	1480.
1500	2.28	34.52	1484	27.59	58.5	14.56	87.04	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 4
50-0.0 N 145-0.0 W
MO.-11 DAY-10 GMT-21.0
0
4
8
12
16
TEMPERATURE, C

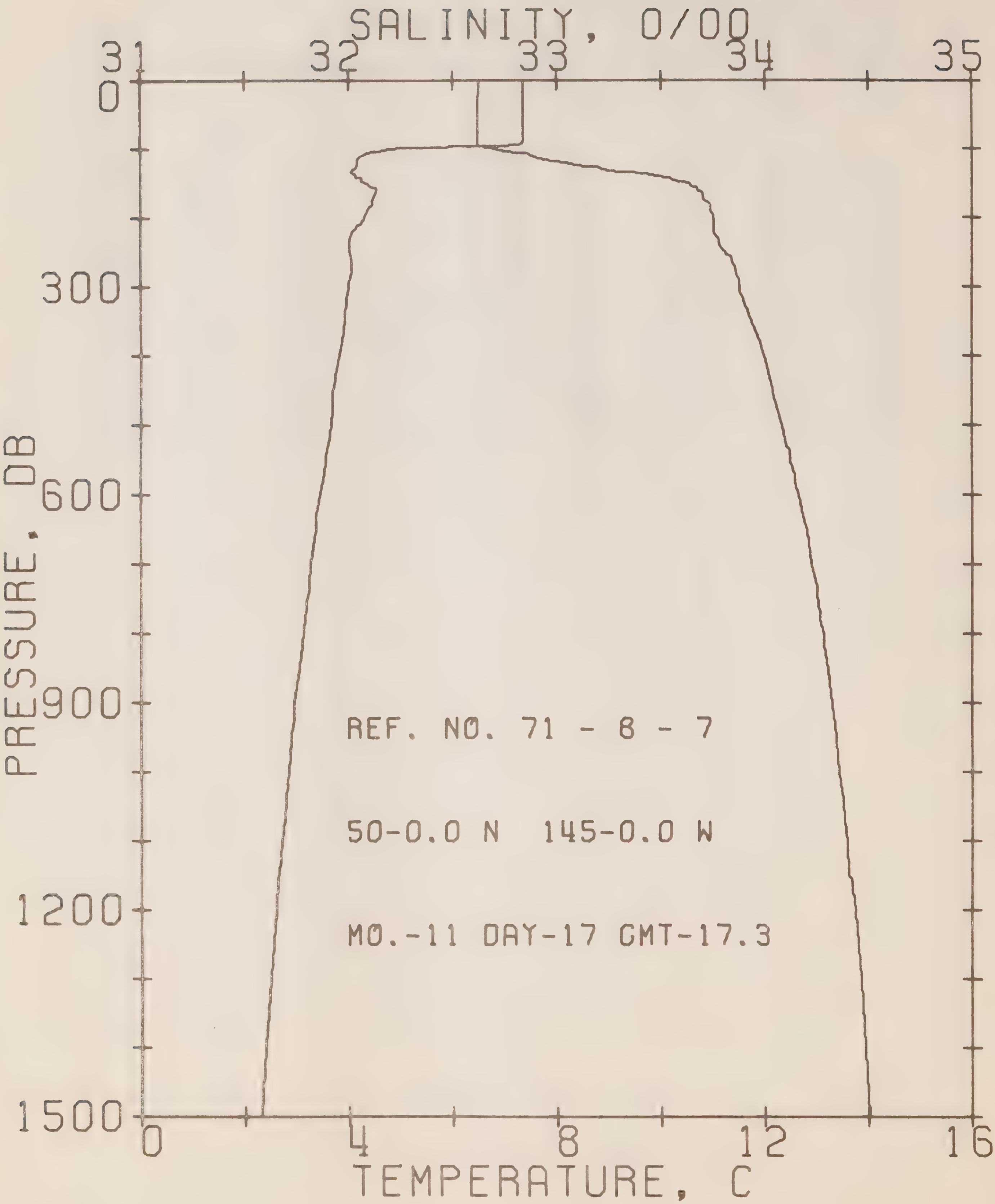
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 4 DATE 10/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 21.0
RESULTS OF STP CAST 102 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.50	32.64	0	25.52	247.4	0.0	0.0	1478.
10	7.51	32.63	10	25.51	248.7	0.25	0.01	1478.
20	7.52	32.63	20	25.51	248.9	0.50	0.05	1478.
30	7.52	32.63	30	25.51	249.1	0.75	0.11	1478.
50	7.52	32.63	50	25.51	249.4	1.24	0.32	1479.
75	7.50	32.62	75	25.50	250.1	1.87	0.71	1479.
100	4.74	32.90	99	26.07	196.4	2.42	1.20	1469.
125	4.46	33.11	124	26.26	178.0	2.88	1.73	1468.
150	4.47	33.48	149	26.55	150.5	3.29	2.30	1469.
175	4.38	33.69	174	26.73	134.1	3.64	2.88	1470.
200	4.31	33.75	199	26.78	129.3	3.97	3.51	1470.
225	4.12	33.80	223	26.85	123.4	4.28	4.20	1469.
250	4.09	33.84	248	26.88	120.5	4.59	4.93	1470.
300	3.98	33.90	298	26.94	115.2	5.18	6.59	1470.
400	3.79	34.02	397	27.05	105.1	6.28	10.52	1471.
500	3.62	34.11	496	27.14	97.4	7.30	15.15	1472.
600	3.42	34.19	595	27.22	90.0	8.23	20.38	1473.
800	3.12	34.31	793	27.35	79.4	9.93	32.45	1475.
1000	2.87	34.37	990	27.42	73.5	11.46	46.43	1478.
1200	2.63	34.44	1188	27.50	66.8	12.85	62.07	1480.
1500	2.33	34.52	1484	27.59	59.1	14.73	87.87	1484.


SALINITY, O/OO
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 8 - 6
50-0.0 N 145-0.0 W
MO.-11 DAY-13 GMT-17.3
0
4
8
12
16
TEMPERATURE, C

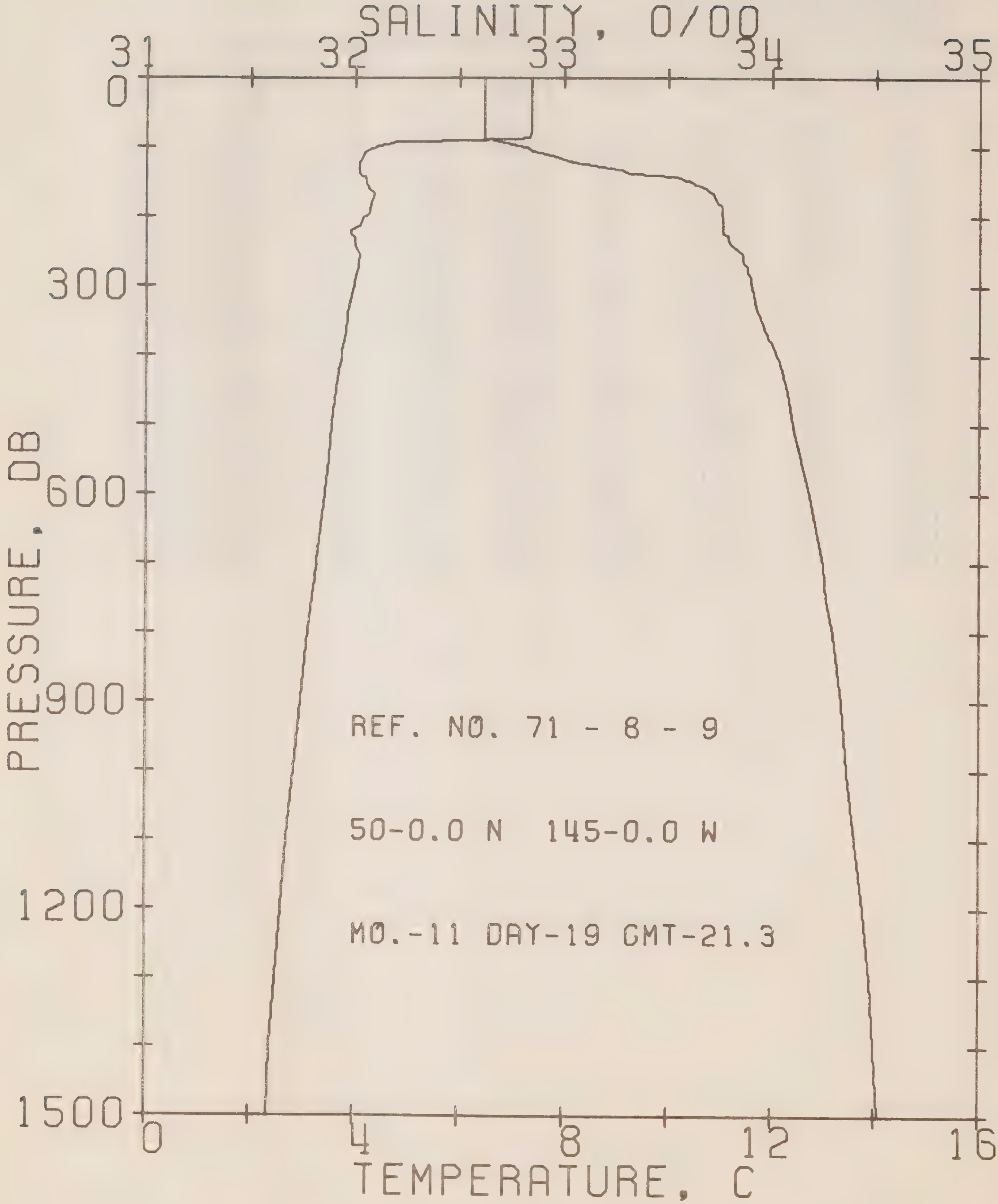
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 6 DATE 13/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 17.3
RESULTS OF STP CAST 64 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.50	32.63	0	25.51	248.2	0.0	0.0	1478.
10	7.50	32.63	10	25.51	248.7	0.25	0.01	1478.
20	7.50	32.63	20	25.51	249.0	0.50	0.05	1478.
30	7.51	32.62	30	25.50	249.3	0.75	0.11	1478.
50	7.51	32.62	50	25.50	250.0	1.25	0.32	1479.
75	7.51	32.62	75	25.50	250.4	1.87	0.72	1479.
100	4.59	32.90	99	26.08	194.9	2.43	1.21	1468.
125	4.22	33.39	124	26.51	154.4	2.88	1.72	1468.
150	4.16	33.68	149	26.74	132.6	3.23	2.22	1468.
175	4.15	33.74	174	26.79	127.9	3.56	2.76	1469.
200	4.06	33.78	199	26.84	124.3	3.87	3.36	1469.
225	3.97	33.81	223	26.87	121.1	4.18	4.02	1469.
250	3.90	33.84	248	26.90	118.5	4.48	4.75	1469.
300	3.87	33.91	298	26.96	113.3	5.06	6.37	1470.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 7
50-0.0 N 145-0.0 W
MO.-11 DAY-17 GMT-17.3
0
4
8
12
16
TEMPERATURE, C

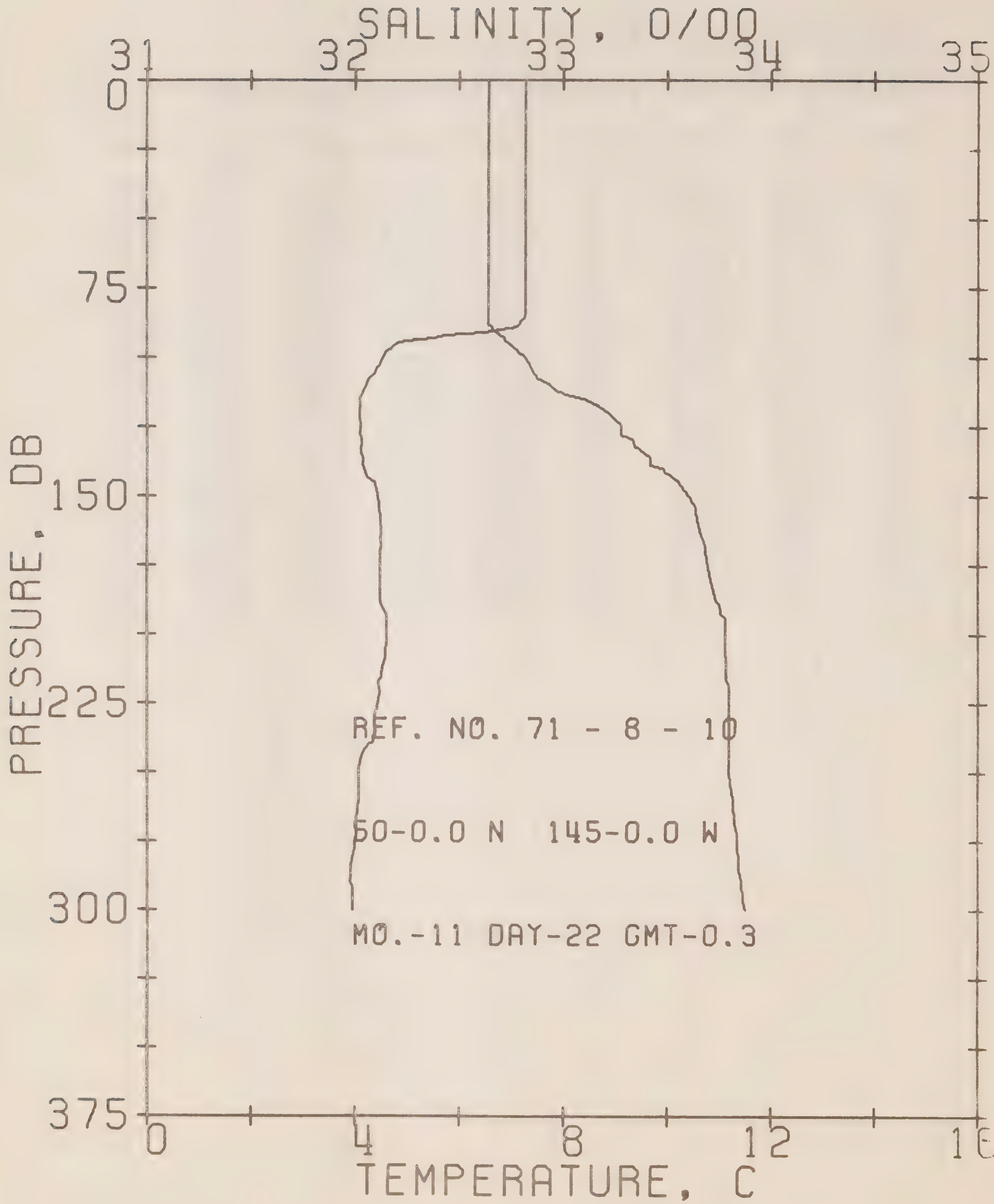
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 7 DATE 17/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 17.3
RESULTS OF STP CAST 117 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.36	32.63	0	25.53	246.3	0.0	0.0	1477.
10	7.36	32.63	10	25.53	246.9	0.25	0.01	1478.
20	7.36	32.62	20	25.53	247.2	0.49	0.05	1478.
30	7.36	32.62	30	25.52	247.5	0.74	0.11	1478.
50	7.36	32.62	50	25.52	248.0	1.24	0.32	1478.
75	7.36	32.62	75	25.52	248.3	1.86	0.71	1479.
100	4.79	32.70	99	25.90	212.0	2.47	1.25	1469.
125	4.18	33.14	124	26.32	172.9	2.95	1.80	1467.
150	4.33	33.63	149	26.69	138.1	3.33	2.34	1469.
175	4.45	33.72	174	26.75	132.6	3.67	2.90	1470.
200	4.33	33.75	199	26.78	129.3	4.00	3.52	1470.
225	4.07	33.77	223	26.83	125.3	4.31	4.21	1469.
250	4.02	33.81	248	26.86	121.9	4.62	4.96	1469.
300	4.00	33.88	298	26.92	117.0	5.22	6.62	1470.
400	3.83	34.00	397	27.03	107.0	6.34	10.61	1471.
500	3.68	34.09	496	27.12	99.5	7.37	15.34	1472.
600	3.47	34.17	595	27.20	92.1	8.33	20.71	1473.
800	3.14	34.29	793	27.33	81.0	10.06	33.00	1475.
1000	2.85	34.36	990	27.41	74.0	11.60	47.16	1477.
1200	2.62	34.44	1188	27.50	66.7	13.01	62.92	1480.
1500	2.32	34.51	1484	27.58	59.7	14.90	88.82	1484.


SALINITY, O/OO
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 9
50-0.0 N 145-0.0 W
MO.-11 DAY-19 GMT-21.3
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 9 DATE 19/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 21.3
RESULTS OF STP CAST 108 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.39	32.62	0	25.52	247.4	0.0	0.0	1477.
10	7.39	32.62	10	25.52	247.8	0.25	0.01	1478.
20	7.39	32.62	20	25.52	247.9	0.50	0.05	1478.
30	7.39	32.62	30	25.52	248.1	0.74	0.11	1478.
50	7.39	32.62	50	25.52	248.4	1.24	0.32	1478.
75	7.39	32.62	75	25.52	248.7	1.86	0.71	1479.
100	4.41	32.82	99	26.04	199.0	2.44	1.23	1467.
125	4.08	33.12	124	26.31	173.5	2.91	1.76	1467.
150	4.20	33.61	149	26.69	138.1	3.30	2.30	1468.
175	4.36	33.73	174	26.77	130.5	3.63	2.86	1470.
200	4.23	33.77	199	26.81	126.8	3.95	3.47	1469.
225	3.91	33.77	223	26.85	123.3	4.27	4.15	1468.
250	4.05	33.85	248	26.89	119.5	4.57	4.89	1470.
300	3.99	33.91	298	26.95	114.6	5.16	6.53	1470.
400	3.76	34.03	397	27.06	104.2	6.26	10.44	1471.
500	3.58	34.11	496	27.15	96.9	7.26	15.02	1472.
600	3.45	34.19	595	27.22	90.3	8.19	20.26	1473.
800	3.12	34.30	793	27.34	80.1	9.90	32.38	1475.
1000	2.85	34.37	990	27.42	73.3	11.43	46.37	1478.
1200	2.62	34.45	1188	27.50	66.0	12.82	61.94	1480.
1500	2.34	34.52	1484	27.58	59.2	14.69	87.58	1484.


SALINITY, 0/00
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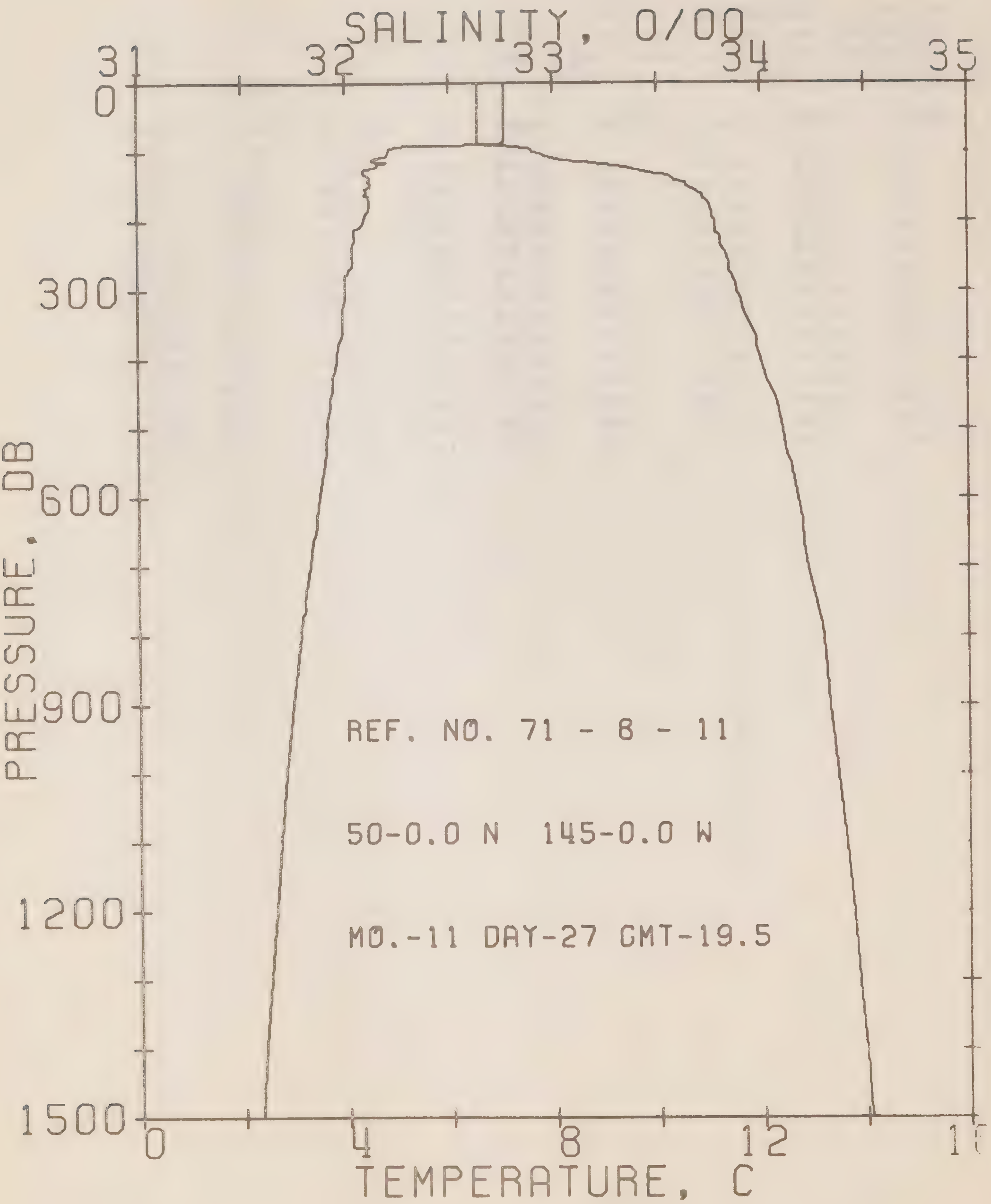
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 8 - 10
50-0.0 N 145-0.0 W
MO.-11 DAY-22 GMT-0.3
0
4
8
12
16
TEMPERATURE, C

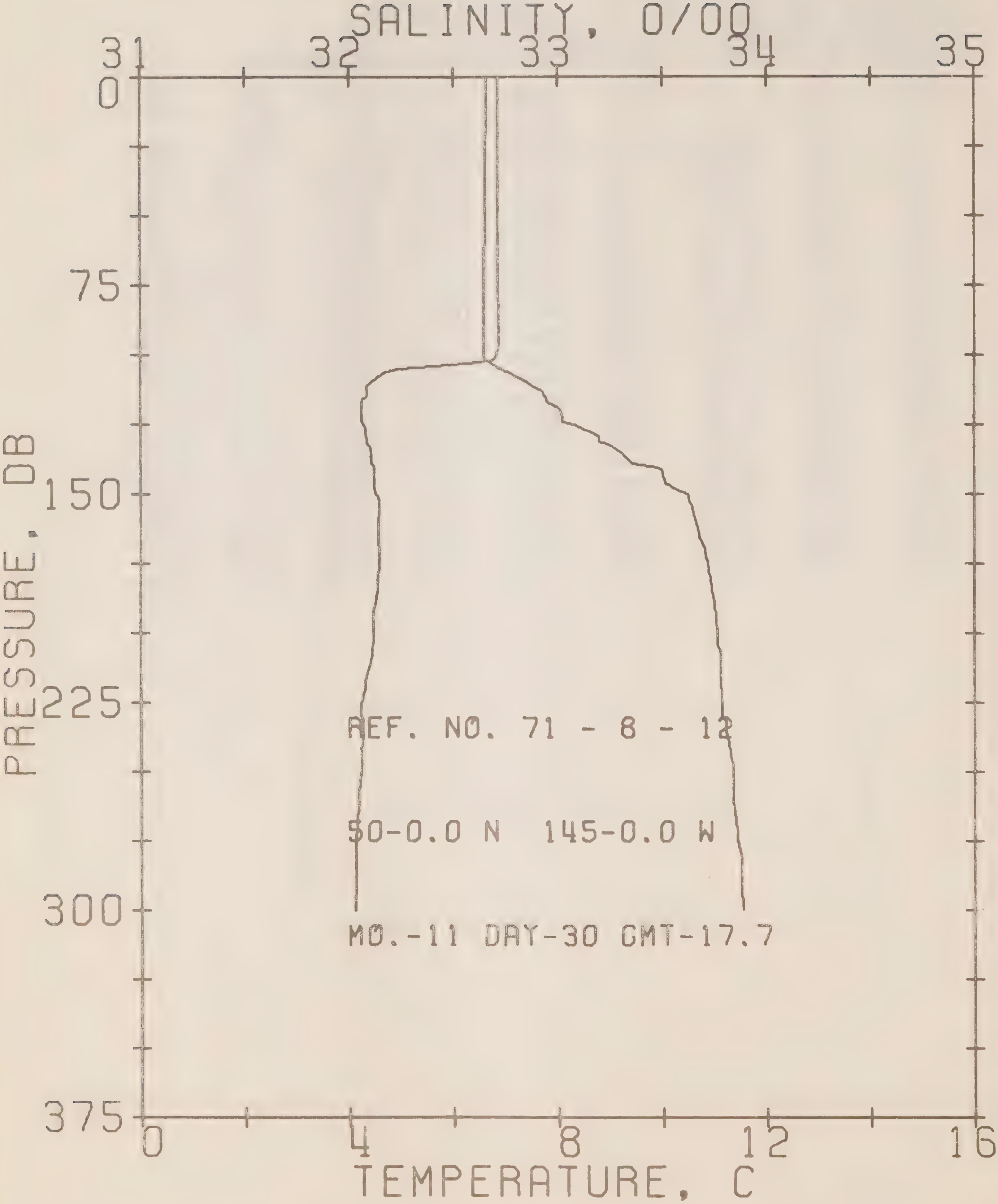
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 10 DATE 22/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 0.3
RESULTS OF STP CAST 99 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.27	32.64	0	25.55	244.4	0.0	0.0	1477.
10	7.27	32.64	10	25.55	244.8	0.24	0.01	1477.
20	7.27	32.64	20	25.55	244.9	0.49	0.05	1477.
30	7.27	32.64	30	25.55	245.1	0.73	0.11	1478.
50	7.28	32.64	50	25.55	245.4	1.22	0.31	1478.
75	7.28	32.64	75	25.55	245.8	1.84	0.70	1478.
100	4.55	32.82	99	26.02	200.5	2.42	1.22	1468.
125	4.10	33.28	124	26.43	161.6	2.87	1.74	1467.
150	4.42	33.61	149	26.66	140.3	3.25	2.26	1469.
175	4.47	33.70	174	26.73	134.1	3.59	2.83	1470.
200	4.61	33.78	199	26.78	130.0	3.92	3.46	1471.
225	4.44	33.80	223	26.81	126.9	4.24	4.16	1471.
250	4.08	33.80	248	26.85	123.3	4.56	4.91	1470.
300	3.95	33.88	298	26.93	116.5	5.16	6.59	1470.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 11
50-0.0 N 145-0.0 W
MO.-11 DAY-27 GMT-19.5
0
4
8
12
TEMPERATURE, C

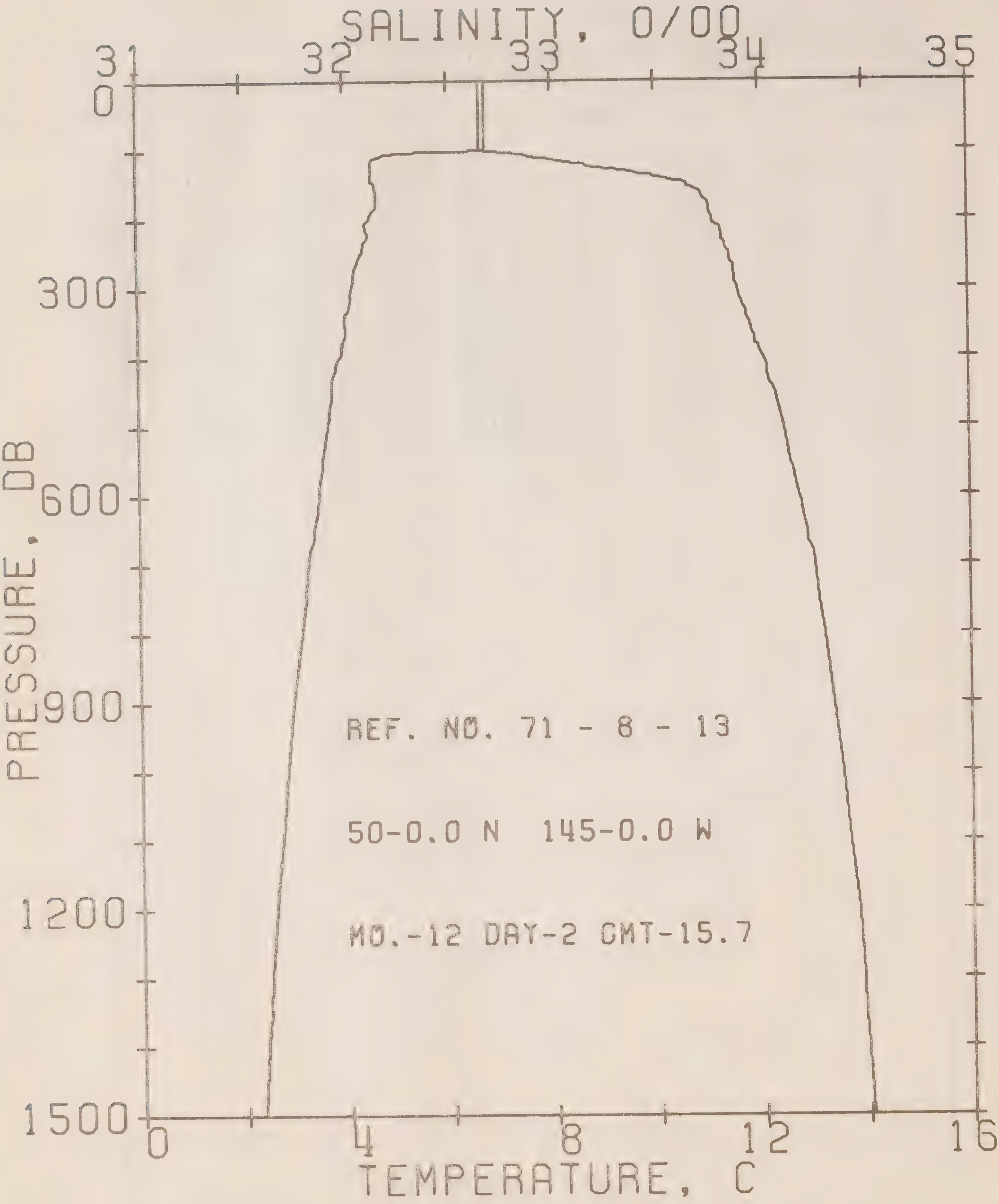
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 11 DATE 27/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 19.5
RESULTS OF STP CAST 110 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.06	32.64	0	25.58	241.7	0.0	0.0	1476.
10	7.06	32.64	10	25.58	242.1	0.24	0.01	1476.
20	7.06	32.64	20	25.58	242.2	0.48	0.05	1477.
30	7.06	32.64	30	25.58	242.3	0.73	0.11	1477.
50	7.06	32.64	50	25.58	242.6	1.21	0.31	1477.
75	7.06	32.64	75	25.58	242.9	1.82	0.70	1477.
100	4.86	32.91	99	26.06	197.0	2.38	1.20	1469.
125	4.41	33.39	124	26.49	156.4	2.83	1.71	1468.
150	4.49	33.65	149	26.69	138.0	3.19	2.22	1470.
175	4.46	33.75	174	26.77	130.4	3.53	2.77	1470.
200	4.36	33.78	199	26.80	127.3	3.85	3.38	1470.
225	4.18	33.81	223	26.85	123.5	4.16	4.06	1470.
250	4.14	33.84	248	26.87	120.9	4.47	4.80	1470.
300	4.00	33.89	298	26.93	116.2	5.06	6.47	1470.
400	3.84	34.00	397	27.03	107.1	6.18	10.43	1471.
500	3.65	34.11	496	27.14	97.9	7.20	15.10	1472.
600	3.50	34.18	595	27.21	91.7	8.15	20.41	1473.
800	3.12	34.30	793	27.34	80.1	9.87	32.65	1475.
1000	2.83	34.37	990	27.42	73.0	11.40	46.70	1477.
1200	2.61	34.44	1188	27.50	66.6	12.80	62.28	1480.
1500	2.32	34.52	1484	27.59	59.0	14.67	88.02	1484.


SALINITY, O/OO
31
32
33
34
35
0
75
150
225
300
375
PRESSURE, DB
REF. NO. 71 - 8 - 12
50-0.0 N 145-0.0 W
MO.-11 DAY-30 GMT-17.7
0
4
8
12
16
TEMPERATURE, C

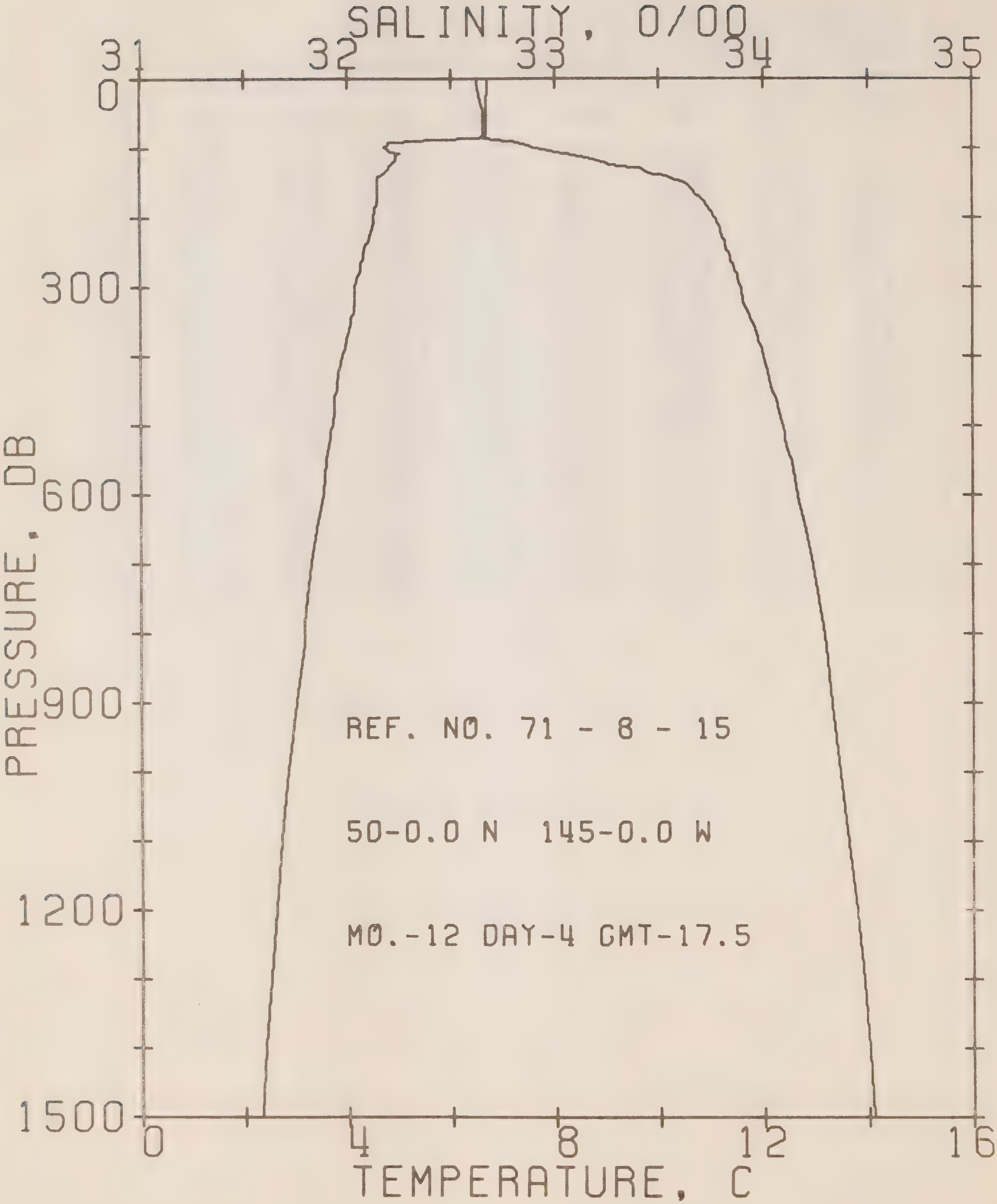
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 12 DATE 30/11/71
POSITION 50- 0.0N, 145- 0.0W GMT 17.7
RESULTS OF STP CAST 77 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.85	32.66	0	25.62	237.6	0.0	0.0	1475.
10	6.85	32.66	10	25.62	238.0	0.24	0.01	1476.
20	6.85	32.66	20	25.62	238.2	0.48	0.05	1476.
30	6.85	32.66	30	25.62	238.4	0.71	0.11	1476.
50	6.86	32.65	50	25.62	239.0	1.19	0.30	1476.
75	6.86	32.65	75	25.61	239.6	1.79	0.69	1477.
100	6.85	32.65	99	25.61	239.8	2.39	1.22	1477.
125	4.26	33.08	124	26.26	178.2	2.89	1.79	1467.
150	4.50	33.63	149	26.67	139.6	3.28	2.34	1470.
175	4.58	33.72	174	26.73	133.7	3.62	2.91	1470.
200	4.48	33.77	199	26.78	129.3	3.95	3.53	1470.
225	4.25	33.79	223	26.82	125.7	4.27	4.23	1470.
250	4.24	33.84	248	26.86	122.0	4.58	4.98	1470.
300	4.11	33.89	298	26.92	117.4	5.18	6.65	1471.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 13
50-0.0 N 145-0.0 W
MO.-12 DAY-2 GMT-15.7
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 13 DATE 2/12/71
POSITION 50- 0.0N, 145- 0.0W GMT 15.7
RESULTS OF STP CAST 118 POINTS TAKEN FROM ANALOG TRACE

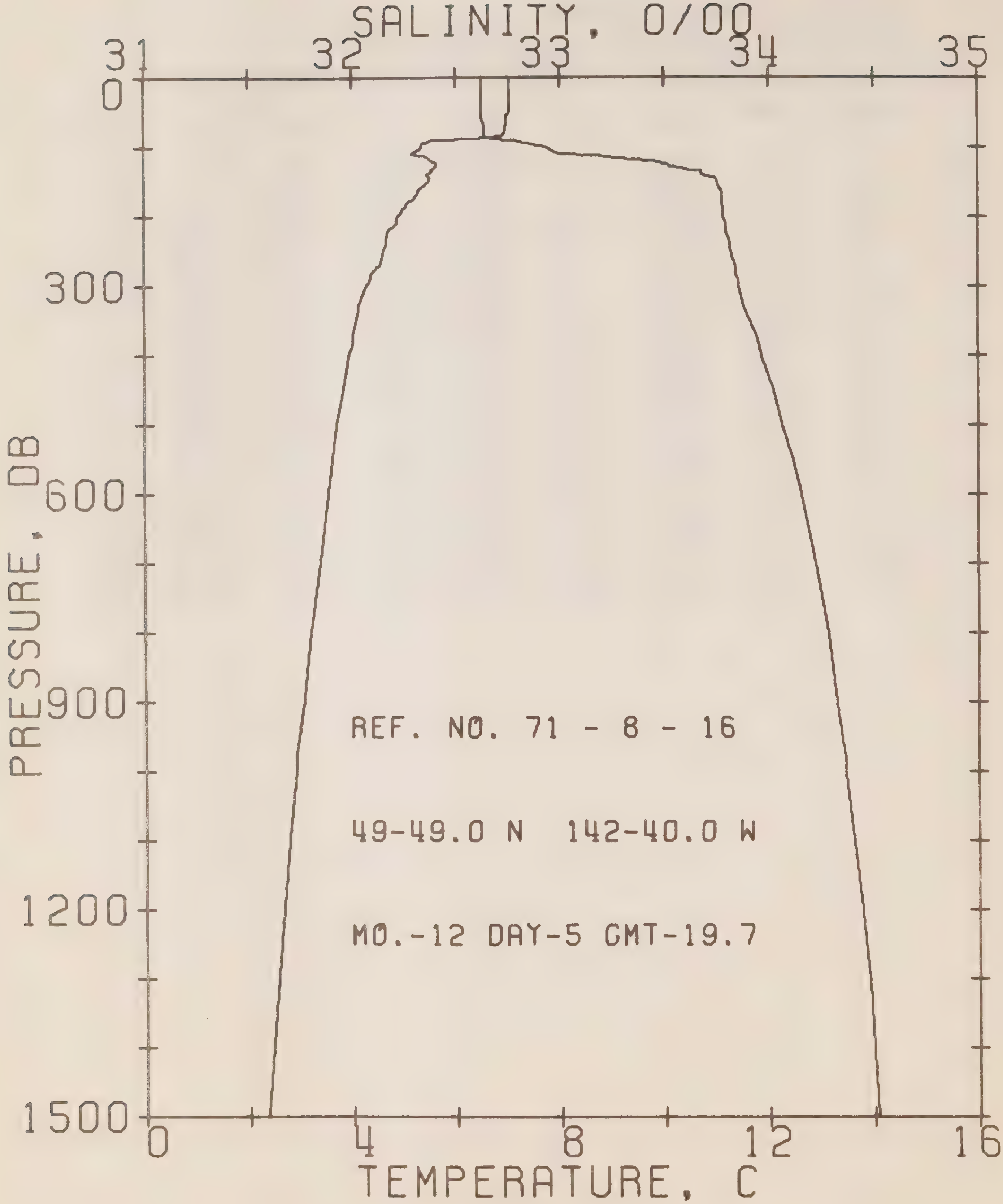
PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.74	32.66	0	25.64	236.1	0.0	0.0	1475.
10	6.74	32.66	10	25.64	236.4	0.24	0.01	1475.
20	6.74	32.66	20	25.64	236.6	0.47	0.05	1475.
30	6.74	32.66	30	25.64	236.7	0.71	0.11	1475.
50	6.74	32.66	50	25.64	237.0	1.18	0.30	1476.
75	6.74	32.66	75	25.64	237.3	1.78	0.68	1476.
100	6.74	32.66	99	25.64	237.6	2.37	1.21	1477.
125	4.55	33.20	124	26.32	172.4	2.85	1.76	1469.
150	4.61	33.66	149	26.68	138.6	3.24	2.30	1470.
175	4.64	33.75	174	26.75	132.1	3.57	2.85	1471.
200	4.52	33.78	199	26.79	129.1	3.90	3.48	1471.
225	4.47	33.83	223	26.83	125.0	4.22	4.16	1471.
250	4.32	33.86	248	26.87	121.4	4.52	4.91	1471.
300	4.15	33.90	298	26.92	117.1	5.12	6.58	1471.
400	3.91	34.02	397	27.04	106.4	6.24	10.57	1472.
500	3.68	34.12	496	27.14	97.2	7.25	15.21	1472.
600	3.50	34.19	595	27.22	91.0	8.20	20.48	1473.
800	3.14	34.31	793	27.35	79.6	9.89	32.53	1475.
1000	2.82	34.39	990	27.44	71.4	11.40	46.34	1477.
1200	2.60	34.46	1188	27.51	65.1	12.77	61.66	1480.
1500	2.32	34.52	1484	27.59	59.0	14.63	87.16	1484.



SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 15
50-0.0 N 145-0.0 W
MO.-12 DAY-4 GMT-17.5
0
4
8
12
16
TEMPERATURE, C

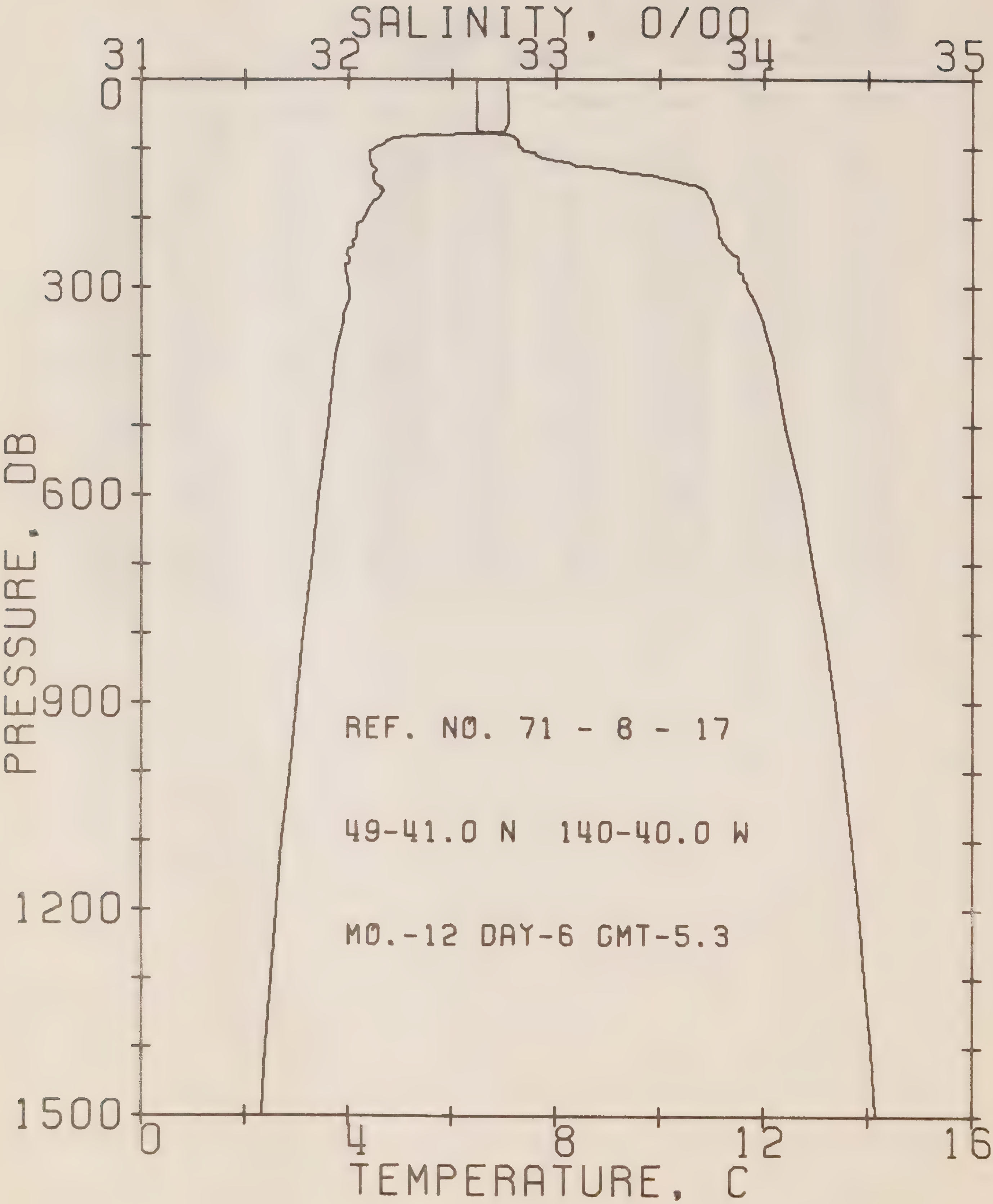
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 15 DATE 4/12/71
POSITION 50- 0.0N, 145- 0.0W GMT 17.5
RESULTS OF STP CAST 121 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	6.74	32.63	0	25.61	238.4	0.0	0.0	1475.
10	6.72	32.63	10	25.62	238.2	0.24	0.01	1475.
20	6.72	32.64	20	25.62	237.8	0.48	0.05	1475.
30	6.70	32.65	30	25.63	237.1	0.71	0.11	1475.
50	6.69	32.66	50	25.64	236.4	1.19	0.30	1476.
75	6.69	32.66	75	25.64	236.7	1.78	0.68	1476.
100	4.72	32.91	99	26.08	195.5	2.33	1.17	1469.
125	4.85	33.29	124	26.37	168.3	2.78	1.69	1470.
150	4.60	33.63	149	26.66	140.6	3.17	2.22	1470.
175	4.62	33.72	174	26.73	134.4	3.51	2.79	1471.
200	4.52	33.77	199	26.78	129.5	3.84	3.42	1471.
225	4.46	33.81	223	26.82	126.4	4.16	4.11	1471.
250	4.34	33.84	248	26.85	123.0	4.47	4.87	1471.
300	4.17	33.90	298	26.92	117.3	5.07	6.55	1471.
400	3.92	34.01	397	27.03	107.2	6.20	10.57	1472.
500	3.73	34.10	496	27.12	99.3	7.23	15.29	1473.
600	3.54	34.17	595	27.20	92.8	8.19	20.65	1474.
800	3.17	34.29	793	27.33	81.1	9.91	32.91	1475.
1000	2.86	34.37	990	27.42	73.4	11.46	47.06	1478.
1200	2.62	34.45	1188	27.50	66.0	12.85	62.63	1480.
1500	2.32	34.53	1484	27.59	58.3	14.71	88.07	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 16
49-49.0 N 142-40.0 W
MO.-12 DAY-5 GMT-19.7
0
4
8
12
16
TEMPERATURE, C

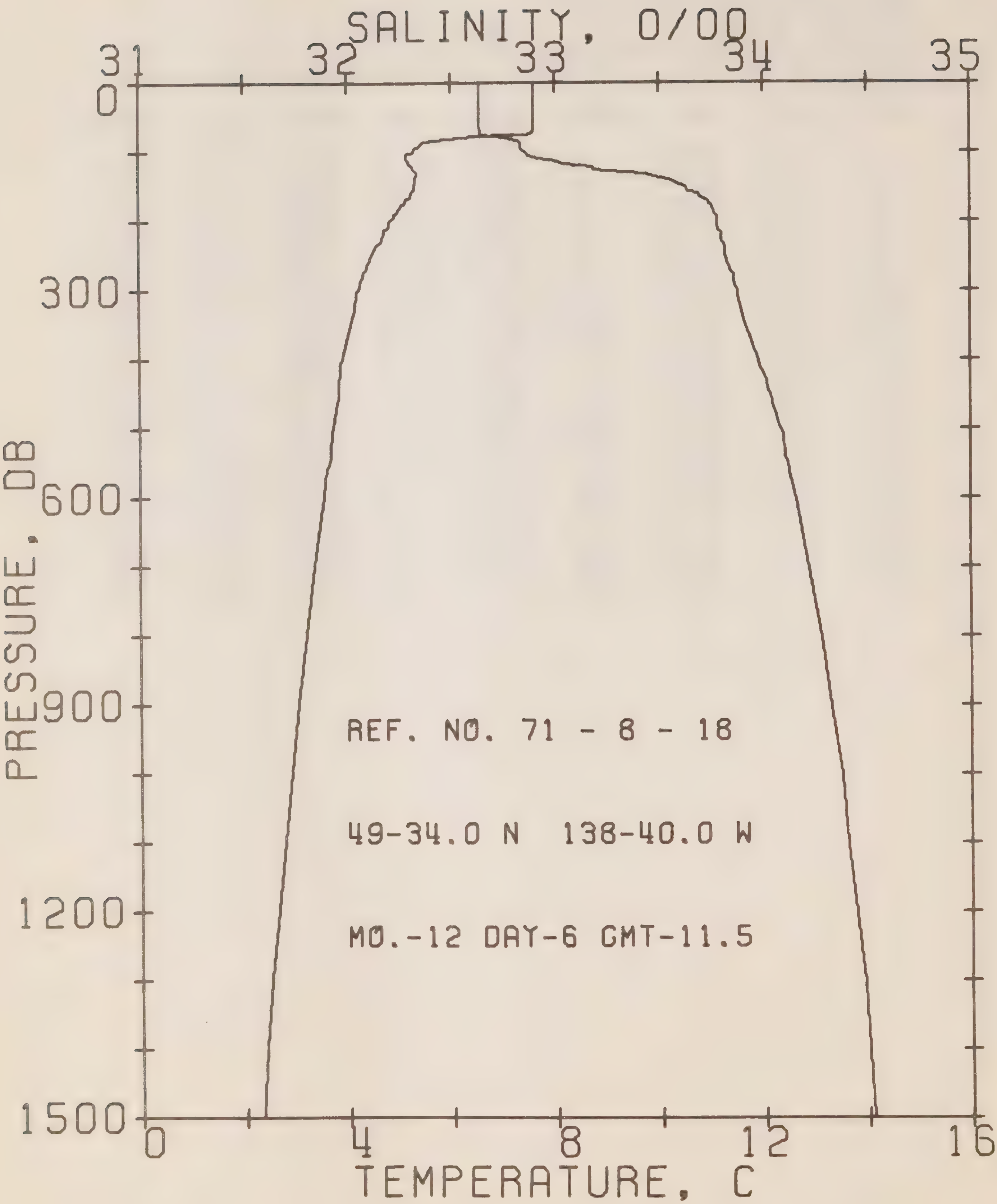
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 16 DATE 5/12/71
POSITION 49-49.0N, 142-40.0W GMT 19.7
RESULTS OF STP CAST 105 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.03	32.63	0	25.57	242.1	0.0	0.0	1476.
10	7.03	32.63	10	25.57	242.4	0.24	0.01	1476.
20	7.03	32.63	20	25.57	242.6	0.48	0.05	1476.
30	7.03	32.63	30	25.57	242.7	0.73	0.11	1477.
50	7.03	32.63	50	25.57	243.0	1.21	0.31	1477.
75	6.98	32.64	75	25.59	241.8	1.82	0.70	1477.
100	5.36	32.93	99	26.02	201.2	2.38	1.20	1471.
125	5.61	33.52	124	26.45	160.2	2.84	1.72	1474.
150	5.48	33.76	149	26.66	141.0	3.21	2.24	1474.
175	5.20	33.78	174	26.71	136.4	3.56	2.81	1473.
200	4.90	33.79	199	26.75	132.5	3.89	3.45	1472.
225	4.71	33.81	223	26.79	129.2	4.22	4.16	1472.
250	4.63	33.83	248	26.81	127.2	4.54	4.93	1472.
300	4.29	33.86	298	26.87	121.5	5.16	6.68	1471.
400	3.96	33.97	397	27.00	110.7	6.32	10.79	1472.
500	3.72	34.07	496	27.10	101.4	7.38	15.62	1473.
600	3.54	34.16	595	27.19	93.6	8.35	21.07	1474.
800	3.21	34.29	793	27.32	81.8	10.10	33.51	1476.
1000	2.91	34.37	990	27.42	73.9	11.65	47.72	1478.
1200	2.67	34.45	1188	27.50	66.5	13.06	63.40	1480.
1500	2.35	34.52	1484	27.58	59.3	14.93	89.19	1484.


SALINITY, O/OO
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 17
49-41.0 N 140-40.0 W
MO.-12 DAY-6 GMT-5.3
0
4
8
12
16
TEMPERATURE, C

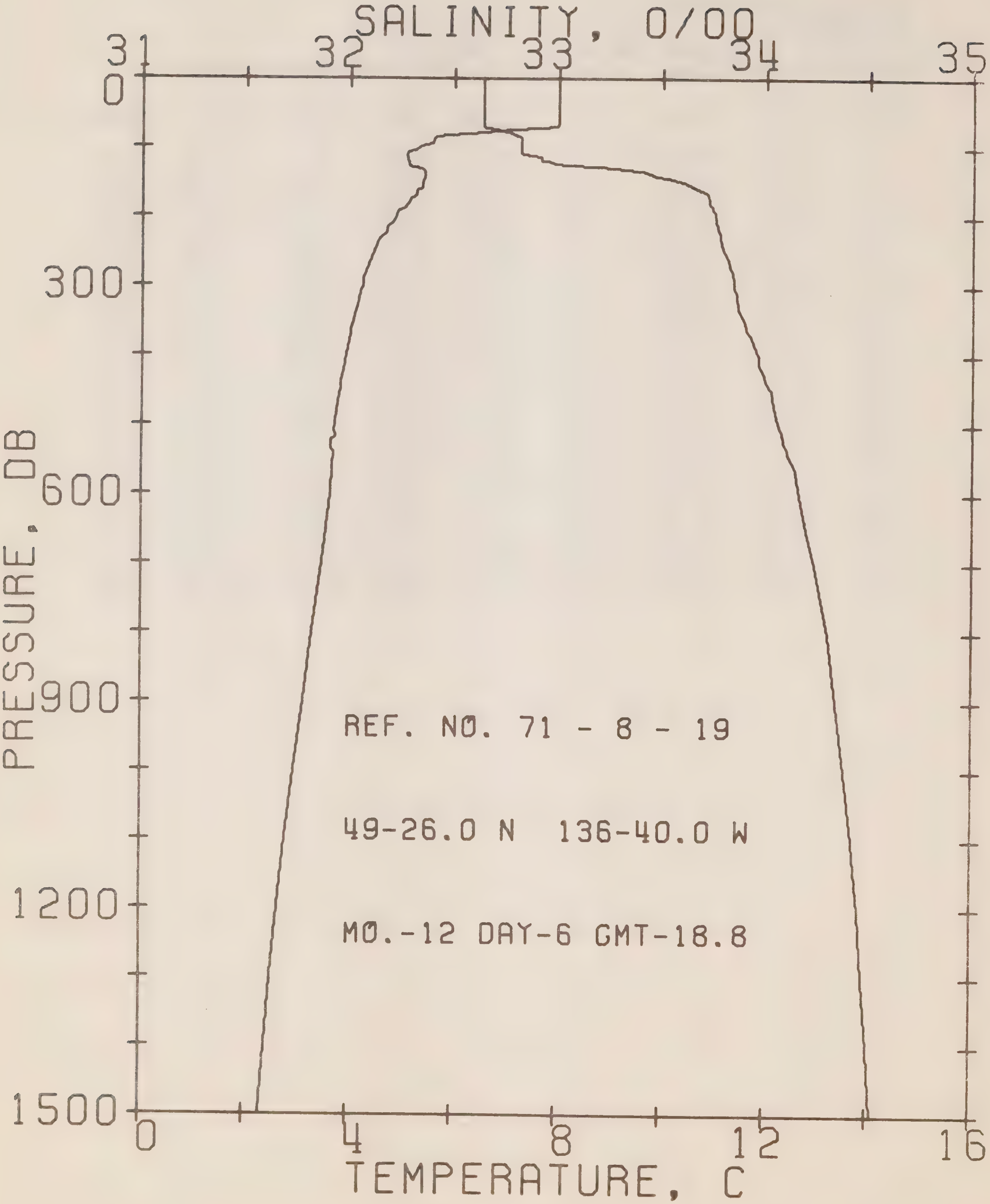
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 17 DATE 6/12/71
POSITION 49-41.0N, 140-40.0W GMT 5.3
RESULTS OF STP CAST 99 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.07	32.62	0	25.56	243.3	0.0	0.0	1476.
10	7.07	32.62	10	25.56	243.7	0.24	0.01	1476.
20	7.08	32.62	20	25.56	243.8	0.49	0.05	1477.
30	7.08	32.62	30	25.56	244.1	0.73	0.11	1477.
50	7.09	32.62	50	25.56	244.4	1.22	0.31	1477.
75	7.01	32.63	75	25.58	243.0	1.83	0.70	1477.
100	4.52	32.84	99	26.04	198.7	2.35	1.17	1468.
125	4.45	33.10	124	26.26	178.7	2.83	1.71	1468.
150	4.50	33.62	149	26.66	140.3	3.22	2.25	1470.
175	4.53	33.75	174	26.76	131.3	3.56	2.81	1470.
200	4.32	33.78	199	26.81	126.9	3.88	3.43	1470.
225	4.18	33.79	223	26.83	125.0	4.19	4.11	1470.
250	3.99	33.85	248	26.90	118.7	4.50	4.85	1469.
300	4.03	33.92	298	26.95	114.3	5.08	6.47	1470.
400	3.77	34.05	397	27.08	102.7	6.16	10.31	1471.
500	3.62	34.11	496	27.14	97.4	7.16	14.88	1472.
600	3.45	34.19	595	27.22	90.3	8.10	20.13	1473.
800	3.14	34.30	793	27.34	80.3	9.81	32.30	1475.
1000	2.87	34.39	990	27.43	72.0	11.33	46.19	1478.
1200	2.61	34.46	1188	27.51	65.1	12.69	61.47	1480.
1500	2.31	34.54	1484	27.60	57.4	14.52	86.58	1484.


SALINITY, O/OO
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 18
49-34.0 N 138-40.0 W
MO.-12 DAY-6 GMT-11.5
0
4
8
12
16
TEMPERATURE, C

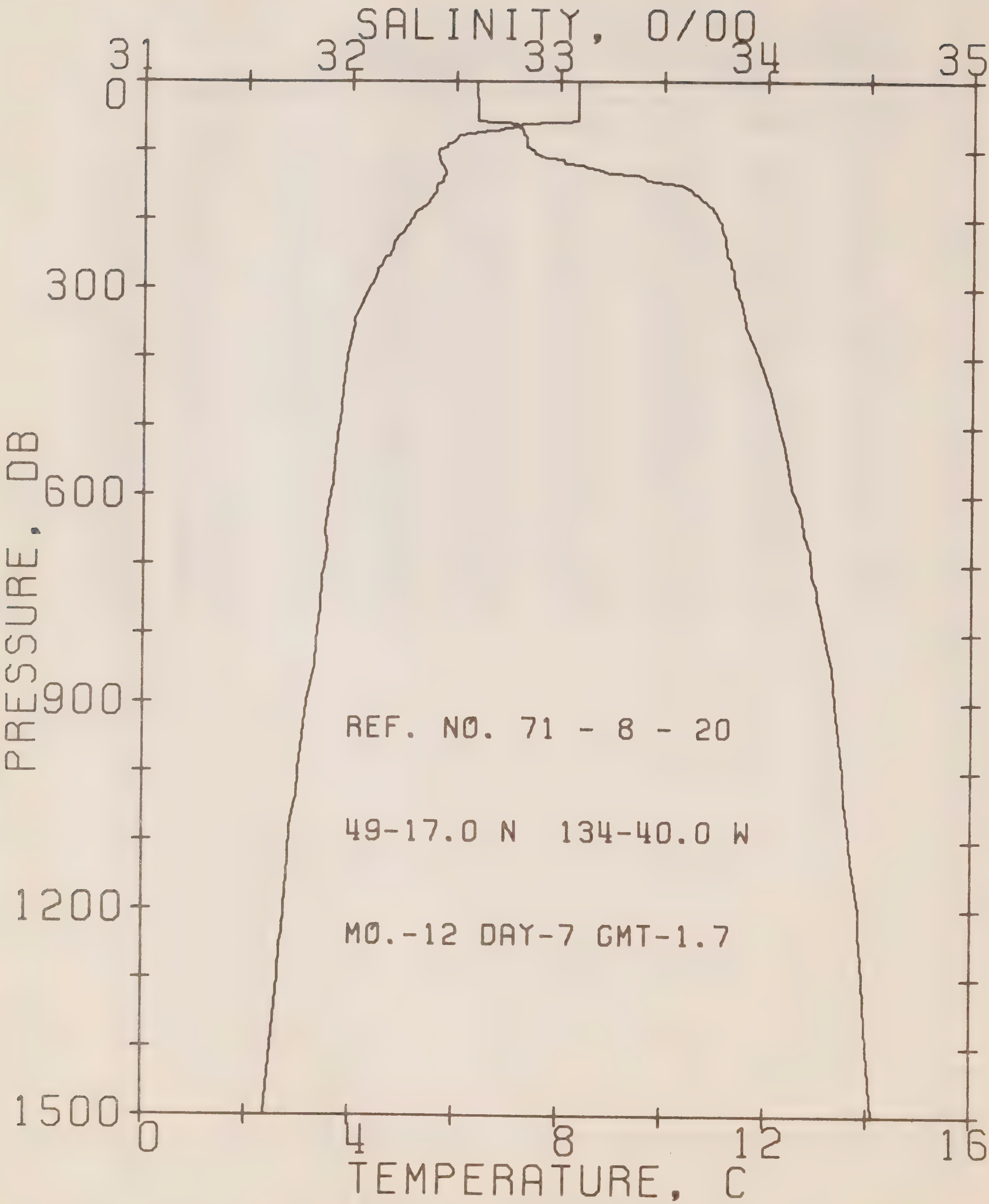
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 18 DATE 6/12/71
POSITION 49-34.0N, 138-40.0W GMT 11.5
RESULTS OF STP CAST 98 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	7.59	32.64	0	25.51	248.6	0.0	0.0	1478.
10	7.61	32.64	10	25.50	249.2	0.25	0.01	1479.
20	7.61	32.64	20	25.50	249.4	0.50	0.05	1479.
30	7.61	32.64	30	25.50	249.5	0.75	0.11	1479.
50	7.61	32.64	50	25.50	249.8	1.25	0.32	1479.
75	7.47	32.65	75	25.53	247.5	1.87	0.72	1479.
100	5.31	32.86	99	25.97	205.6	2.41	1.19	1471.
125	5.28	33.19	124	26.24	180.8	2.89	1.75	1472.
150	5.32	33.63	149	26.58	148.7	3.30	2.31	1473.
175	5.11	33.74	174	26.69	138.3	3.65	2.90	1473.
200	4.86	33.78	199	26.75	132.8	3.99	3.55	1472.
225	4.69	33.80	223	26.78	129.6	4.32	4.26	1472.
250	4.51	33.82	248	26.82	126.1	4.64	5.03	1471.
300	4.25	33.88	298	26.89	119.6	5.25	6.75	1471.
400	3.93	33.98	397	27.01	109.5	6.40	10.84	1472.
500	3.73	34.09	496	27.11	100.1	7.45	15.63	1473.
600	3.54	34.16	595	27.19	93.6	8.42	21.05	1474.
800	3.21	34.28	793	27.32	82.5	10.18	33.56	1476.
1000	2.90	34.38	990	27.42	73.0	11.73	47.78	1478.
1200	2.65	34.45	1188	27.50	66.3	13.13	63.40	1480.
1500	2.32	34.53	1484	27.59	58.3	14.98	88.78	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 19
49-26.0 N 136-40.0 W
MO.-12 DAY-6 GMT-18.8
0
4
8
12
16
TEMPERATURE, C

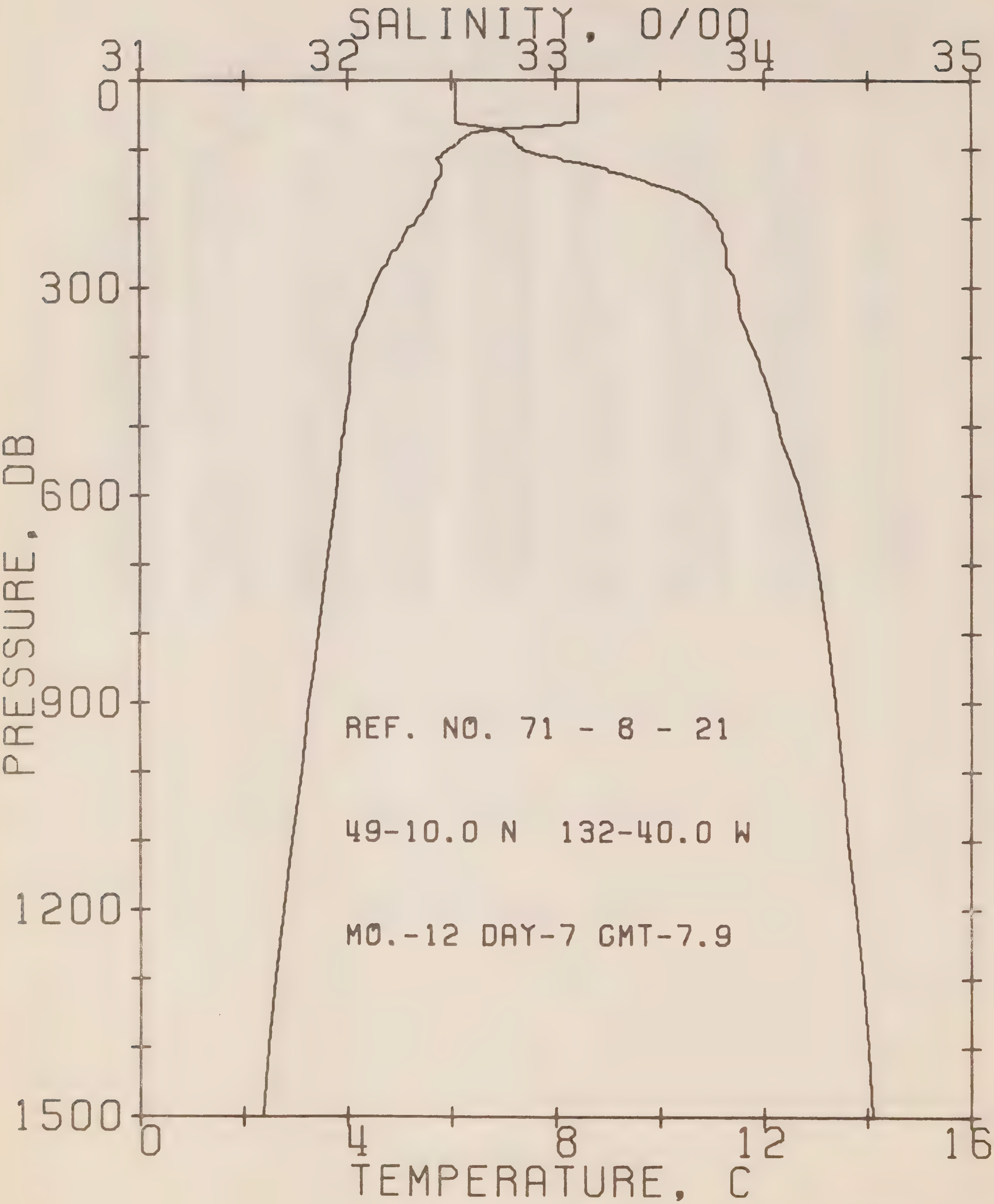
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 19 DATE 6/12/71
POSITION 49-26.0N, 136-40.0W GMT 18.8
RESULTS OF STP CAST 95 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.00	32.64	0	25.45	254.2	0.0	0.0	1480.
10	8.00	32.64	10	25.45	254.6	0.25	0.01	1480.
20	8.00	32.64	20	25.45	254.8	0.51	0.05	1480.
30	8.00	32.64	30	25.45	254.9	0.76	0.12	1480.
50	8.00	32.64	50	25.45	255.2	1.27	0.32	1481.
75	6.99	32.71	75	25.65	236.4	1.91	0.73	1477.
100	5.33	32.82	99	25.94	208.9	2.45	1.21	1471.
125	5.12	33.05	124	26.14	189.5	2.95	1.79	1471.
150	5.42	33.60	149	26.54	152.0	3.37	2.37	1473.
175	5.16	33.73	174	26.67	139.7	3.73	2.97	1473.
200	4.90	33.76	199	26.73	134.7	4.08	3.63	1472.
225	4.67	33.78	223	26.77	130.8	4.41	4.35	1472.
250	4.48	33.80	248	26.81	127.5	4.73	5.13	1471.
300	4.27	33.85	298	26.87	122.0	5.35	6.86	1471.
400	3.96	33.97	397	27.00	110.7	6.52	11.01	1472.
500	3.74	34.07	496	27.10	101.6	7.58	15.86	1473.
600	3.65	34.17	595	27.19	94.0	8.55	21.31	1474.
800	3.30	34.31	793	27.33	81.2	10.31	33.79	1476.
1000	2.97	34.39	990	27.43	73.0	11.85	47.91	1478.
1200	2.67	34.46	1188	27.51	65.8	13.23	63.38	1480.
1500	2.32	34.53	1484	27.59	58.3	15.09	88.88	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 20
49-17.0 N 134-40.0 W
MO.-12 DAY-7 GMT-1.7
0
4
8
12
16
TEMPERATURE, C

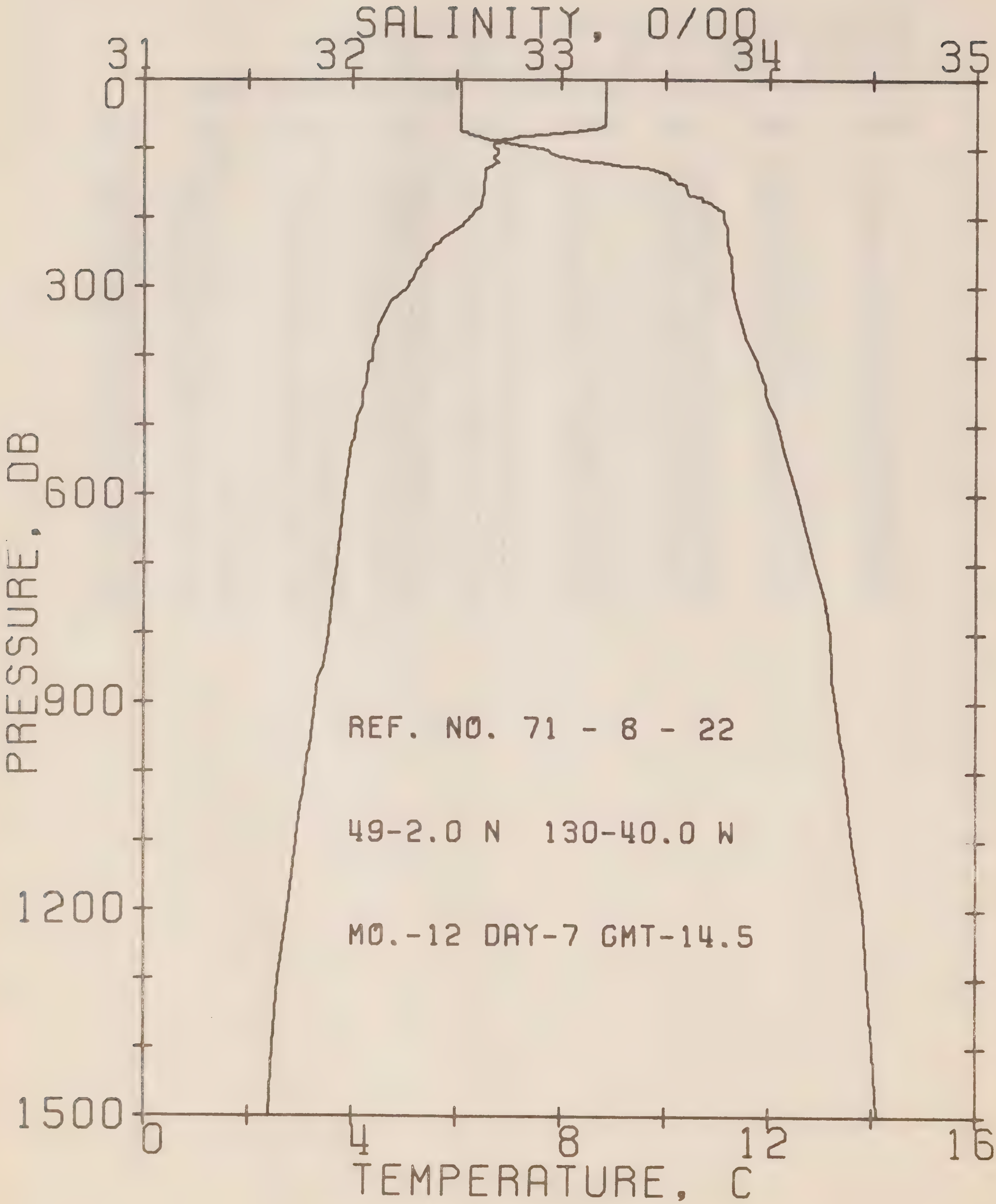
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 20 DATE 7/12/71
POSITION 49-17.0N, 134-40.0W GMT 1.7
RESULTS OF STP CAST 119 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.34	32.60	0	25.37	261.9	0.0	0.0	1481.
10	8.34	32.60	10	25.37	262.3	0.26	0.01	1481.
20	8.34	32.60	20	25.37	262.5	0.52	0.05	1481.
30	8.34	32.61	30	25.37	261.9	0.79	0.12	1482.
50	8.34	32.61	50	25.37	262.2	1.31	0.33	1482.
75	6.38	32.83	75	25.82	220.2	1.92	0.72	1475.
100	5.69	32.87	99	25.93	209.3	2.45	1.20	1473.
125	5.77	33.13	124	26.13	191.0	2.96	1.77	1474.
150	5.66	33.58	149	26.50	156.4	3.40	2.39	1474.
175	5.50	33.70	174	26.61	145.8	3.77	3.01	1474.
200	5.18	33.77	199	26.70	137.1	4.13	3.68	1473.
225	4.91	33.80	223	26.76	132.1	4.46	4.41	1473.
250	4.76	33.81	248	26.78	130.0	4.79	5.20	1473.
300	4.38	33.86	298	26.87	122.4	5.42	6.97	1472.
400	3.95	33.97	397	27.00	110.5	6.59	11.11	1472.
500	3.80	34.07	496	27.09	102.3	7.65	15.97	1473.
600	3.64	34.15	595	27.17	95.4	8.64	21.51	1474.
800	3.38	34.29	793	27.31	83.5	10.42	34.20	1476.
1000	3.01	34.38	990	27.41	74.3	11.99	48.58	1478.
1200	2.74	34.46	1188	27.50	66.5	13.41	64.41	1480.
1500	2.36	34.53	1484	27.59	58.8	15.30	90.39	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 21
49-10.0 N 132-40.0 W
MO.-12 DAY-7 GMT-7.9
0
4
8
12
16
TEMPERATURE, C

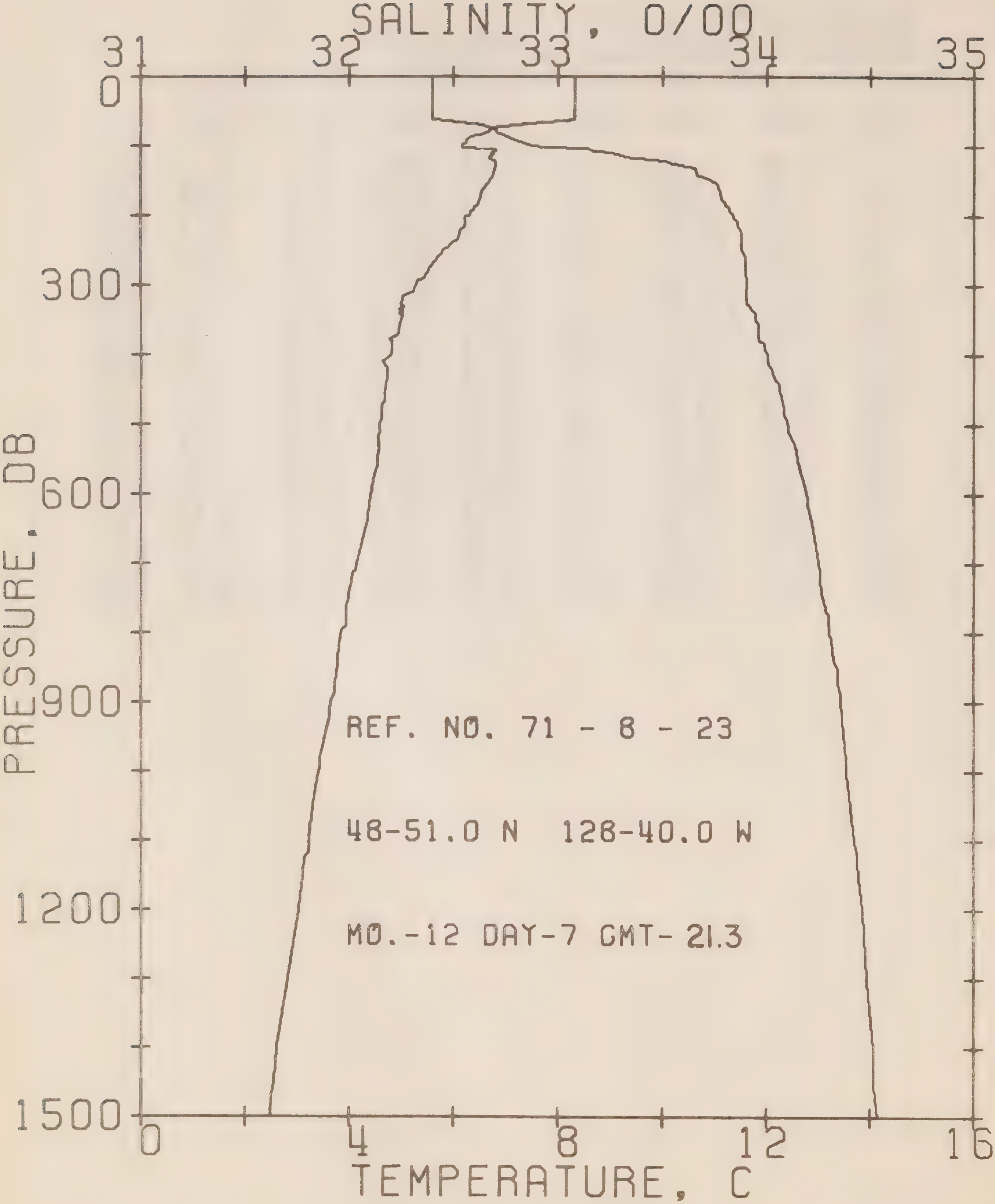
PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 21 DATE 7/12/71
POSITION 49-10.0N, 132-40.0W GMT 7.9
RESULTS OF STP CAST 107 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.47	32.51	0	25.28	270.5	0.0	0.0	1481.
10	8.43	32.52	10	25.29	269.5	0.27	0.01	1482.
20	8.43	32.52	20	25.29	269.6	0.54	0.05	1482.
30	8.43	32.52	30	25.29	269.8	0.81	0.12	1482.
50	8.43	32.52	50	25.29	270.1	1.35	0.34	1482.
75	6.54	32.75	75	25.73	228.1	2.00	0.75	1475.
100	5.94	32.84	99	25.88	214.3	2.55	1.24	1474.
125	5.80	33.20	124	26.18	186.1	3.05	1.82	1474.
150	5.71	33.45	149	26.39	166.6	3.49	2.44	1474.
175	5.60	33.66	174	26.57	149.6	3.89	3.09	1475.
200	5.37	33.76	199	26.67	140.0	4.25	3.78	1474.
225	5.11	33.80	223	26.74	134.4	4.59	4.52	1474.
250	4.85	33.82	248	26.78	130.1	4.92	5.32	1473.
300	4.52	33.87	298	26.86	123.3	5.56	7.10	1472.
400	4.09	33.97	397	26.98	112.0	6.74	11.31	1472.
500	3.95	34.07	496	27.08	103.7	7.81	16.24	1474.
600	3.78	34.18	595	27.18	94.7	8.80	21.78	1475.
800	3.43	34.31	793	27.32	82.7	10.56	34.28	1477.
1000	3.11	34.38	990	27.41	75.3	12.14	48.69	1479.
1200	2.77	34.45	1188	27.49	67.6	13.57	64.73	1481.
1500	2.37	34.53	1484	27.59	58.8	15.46	90.58	1484.


SALINITY, 0/00
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 22
49-2.0 N 130-40.0 W
MO.-12 DAY-7 GMT-14.5
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 22 DATE 7/12/71
POSITION 49- 2.0N, 130-40.0W GMT 14.5
RESULTS OF STP CAST 107 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.85	32.52	0	25.23	275.2	0.0	0.0	1483.
10	8.85	32.52	10	25.23	275.6	0.28	0.01	1483.
20	8.85	32.52	20	25.23	275.7	0.55	0.06	1483.
30	8.85	32.52	30	25.23	275.9	0.83	0.13	1483.
50	8.85	32.52	50	25.23	276.2	1.38	0.35	1484.
75	8.33	32.53	75	25.31	268.4	2.07	0.79	1482.
100	6.75	32.89	99	25.82	220.4	2.67	1.33	1477.
125	6.66	33.30	124	26.15	189.3	3.19	1.92	1478.
150	6.54	33.56	149	26.37	168.6	3.63	2.54	1478.
175	6.50	33.68	174	26.47	159.5	4.04	3.21	1478.
200	6.25	33.78	199	26.58	149.0	4.42	3.94	1478.
225	5.85	33.80	223	26.65	143.0	4.79	4.73	1477.
250	5.49	33.81	248	26.70	138.0	5.14	5.58	1476.
300	5.10	33.83	298	26.76	132.8	5.81	7.48	1475.
400	4.41	33.94	397	26.92	118.0	7.06	11.91	1474.
500	4.08	34.05	496	27.05	106.9	8.19	17.06	1474.
600	3.88	34.14	595	27.14	98.8	9.21	22.81	1475.
800	3.57	34.30	793	27.30	85.0	11.04	35.78	1477.
1000	3.13	34.37	991	27.40	76.4	12.65	50.55	1479.
1200	2.77	34.46	1188	27.50	66.9	14.09	66.58	1481.
1500	2.39	34.53	1484	27.59	59.0	15.97	92.37	1484.


SALINITY, O/OO
31
32
33
34
35
0
300
600
900
1200
1500
PRESSURE, DB
REF. NO. 71 - 8 - 23
48-51.0 N 128-40.0 W
MO.-12 DAY-7 GMT- 21.3
0
4
8
12
16
TEMPERATURE, C

PACIFIC OCEANOGRAPHIC GROUP
REFERENCE NO. 71- 8- 23 DATE 7/12/71
POSITION 48-51.0N, 128-40.0W GMT 21.3
RESULTS OF STP CAST 153 POINTS TAKEN FROM ANALOG TRACE

PRESS	TEMP	SAL	DEPTH	SIGMA T	SVA	DELTA D	POT. EN	SOUND
0	8.31	32.40	0	25.21	276.4	0.0	0.0	1481.
10	8.31	32.40	10	25.21	276.7	0.28	0.01	1481.
20	8.31	32.40	20	25.21	276.9	0.55	0.06	1481.
30	8.31	32.40	30	25.21	277.0	0.83	0.13	1481.
50	8.31	32.40	50	25.21	277.4	1.38	0.35	1482.
75	6.72	32.69	75	25.66	234.9	2.05	0.77	1476.
100	6.17	32.88	99	25.88	214.1	2.61	1.27	1475.
125	6.80	33.55	124	26.33	172.4	3.09	1.82	1478.
150	6.71	33.74	149	26.49	157.4	3.50	2.39	1479.
175	6.53	33.79	174	26.55	151.8	3.88	3.03	1478.
200	6.29	33.84	199	26.62	145.2	4.25	3.74	1478.
225	6.13	33.88	223	26.68	140.6	4.61	4.51	1478.
250	5.83	33.89	248	26.72	136.7	4.96	5.36	1477.
300	5.32	33.91	298	26.80	129.4	5.62	7.21	1476.
400	4.82	34.01	397	26.94	117.1	6.85	11.60	1475.
500	4.59	34.11	496	27.04	108.3	7.98	16.75	1476.
600	4.45	34.20	595	27.12	101.0	9.03	22.62	1477.
800	3.86	34.31	793	27.28	87.4	10.91	36.04	1478.
1000	3.41	34.39	991	27.38	78.0	12.56	51.12	1480.
1200	3.03	34.47	1188	27.48	69.1	14.03	67.59	1482.
1500	2.47	34.54	1484	27.59	59.2	15.96	93.96	1484.

SURFACE TEMPERATURE AND SALINITY OBSERVATIONS

(P-71-8)

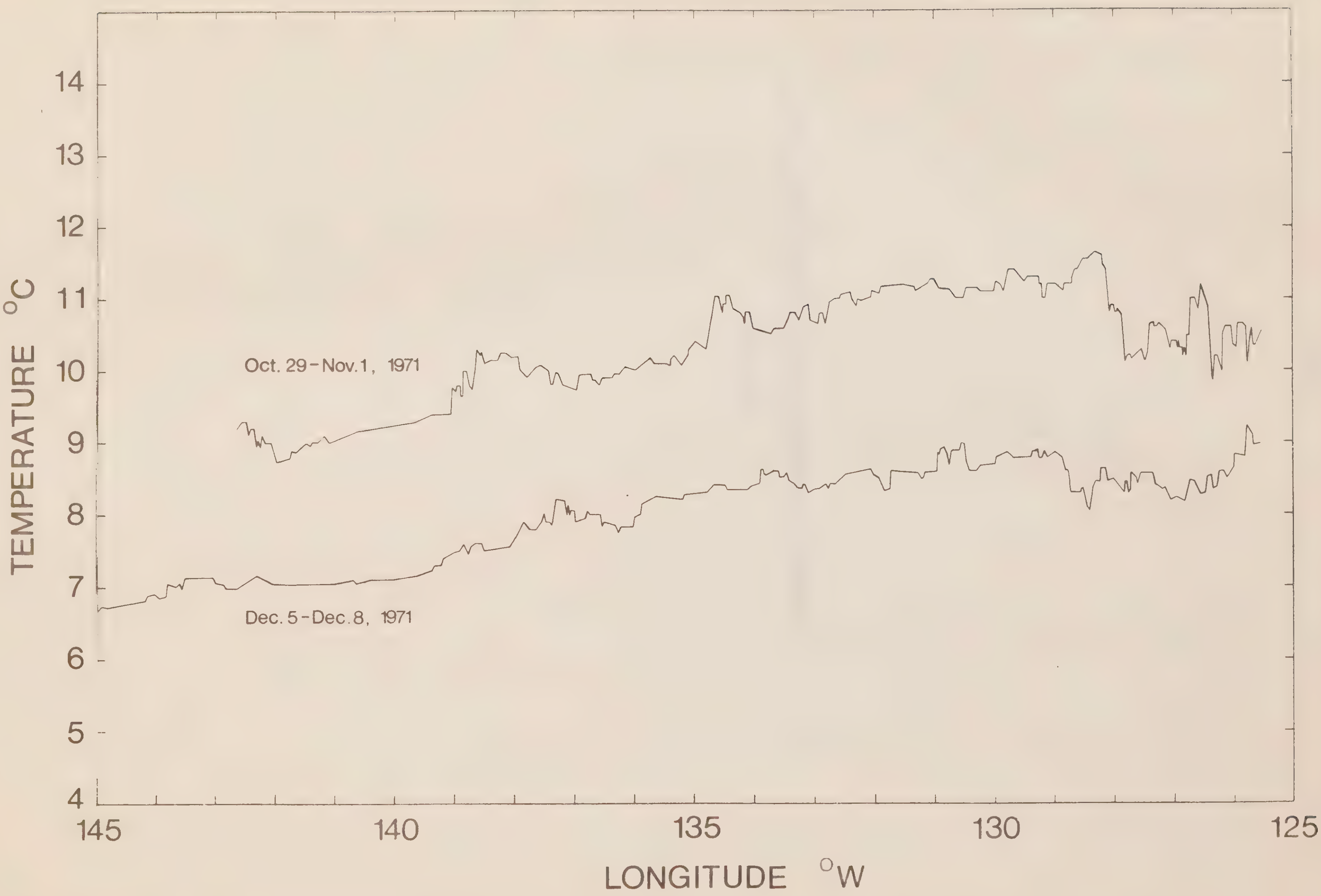


FIG. 19 LINE P ENGINE INTAKE CONTINUOUS THERMOGRAPH TEMPERATURE RECORDS OUTBOUND AND INBOUND P-71-8.

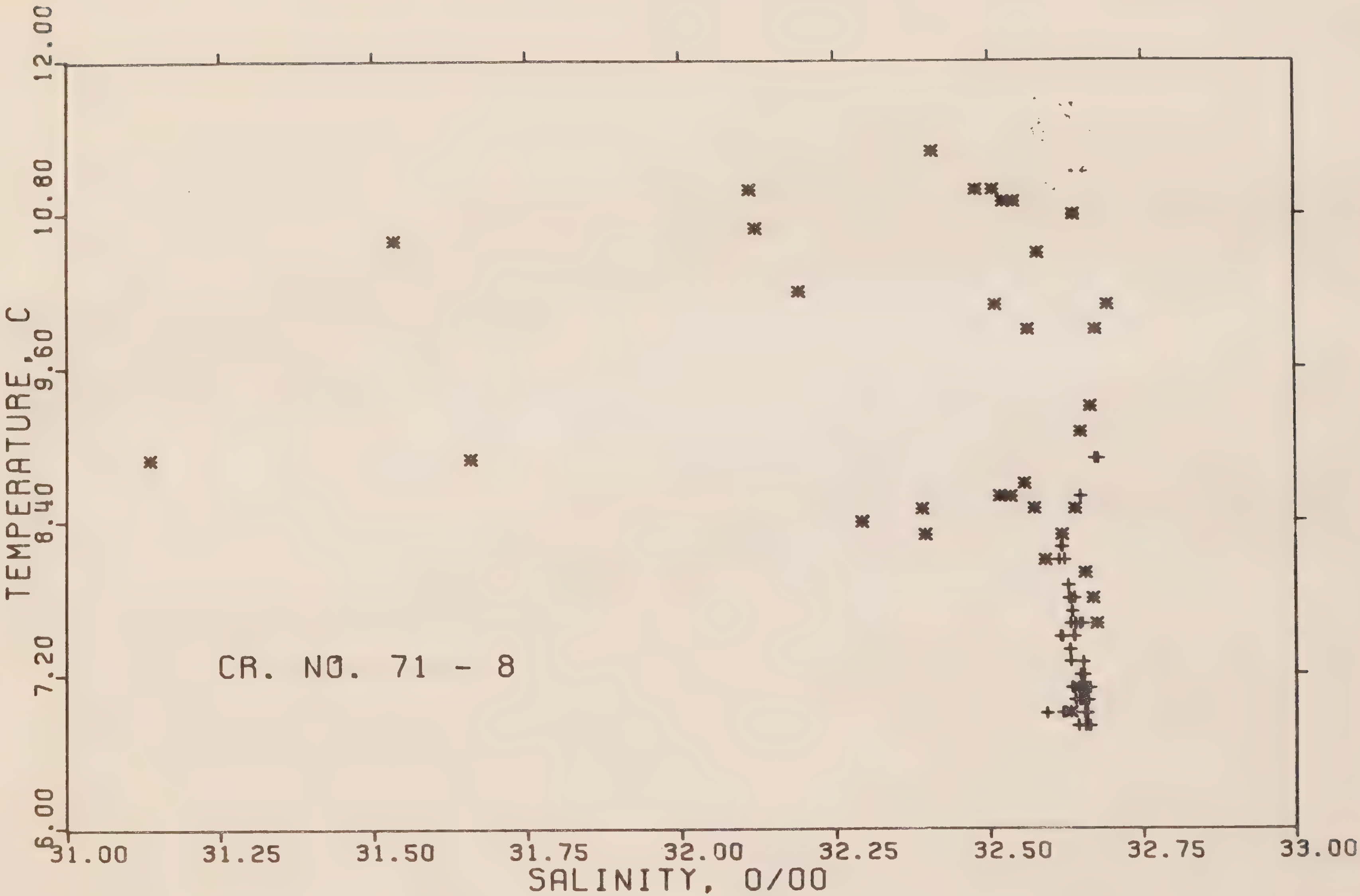


Fig. 20 T-S plot of surface temperature and salinity observations on Line P (asterisks) and at Station P (pluses) during Cruise P-71-8.

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 8

DATE/TIME YR	MO	DY	GMT	SALINITY 0/00	TEMP C	LONGITUDE WEST
71	10	30	300	32.122	10.7	125-32
71	10	30	435	31.534	10.6	126- 0
71	10	30	640	32.112	11.0	126-40
71	10	30	945	32.191	10.2	127-40
71	10	30	1250	32.407	11.3	128-40
71	10	30	1600	32.523	10.9	129-40
71	10	30	1925	32.540	10.9	130-40
71	10	30	2255	32.506	11.0	131-40
71	10	31	205	32.479	11.0	132-40
71	10	31	530	32.579	10.5	133-40
71	10	31	920	32.638	10.8	134-40
71	10	31	1305	32.510	10.1	135-40
71	10	31	1655	32.563	9.9	136-40
71	10	31	2040	32.673	9.9	137-40
71	11	1	30	32.693	10.1	138-40
71	11	1	525	32.664	9.3	139-40
71	11	1	1025	32.647	9.1	140-40
71	11	1	1520	32.676	8.9	141-40
71	11	1	2015	32.671	8.9	142-40
71	11	2	10	32.648	8.6	143-40
71	11	3	0	32.617	8.2	145- 0
71	11	4	0	32.616	8.2	145- 0
71	11	5	0	32.621	8.1	145- 0
71	11	6	0	32.613	8.1	145- 0
71	11	7	0	32.638	7.8	145- 0
71	11	8	0	32.628	7.9	145- 0
71	11	9	0	32.629	7.8	145- 0
71	11	10	0	32.636	7.5	145- 0
71	11	11	0	32.639	7.6	145- 0
71	11	12	0	32.646	7.6	145- 0
71	11	13	0	32.634	7.7	145- 0
71	11	14	0	32.630	7.8	145- 0
71	11	15	0	32.631	7.8	145- 0
71	11	16	0	32.650	7.6	145- 0
71	11	18	0	32.631	7.6	145- 0
71	11	19	0	32.638	7.5	145- 0
71	11	20	0	32.615	7.5	145- 0
71	11	21	0	32.631	7.3	145- 0
71	11	22	0	32.630	7.4	145- 0
71	11	23	0	32.618	7.5	145- 0
71	11	24	0	32.634	7.1	145- 0
71	11	28	0	32.651	7.3	145- 0
71	11	29	0	32.653	7.2	145- 0
71	11	30	0	32.647	7.2	145- 0
71	11	30	100	32.648	7.0	145- 0
71	11	30	200	32.639	7.0	145- 0
71	11	30	300	32.648	7.1	145- 0
71	11	30	400	32.652	7.0	145- 0
71	11	30	500	32.654	7.0	145- 0

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 8

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	11	30	500	32.654	7.0	145- 0
71	11	30	600	32.653	7.1	145- 0
71	11	30	700	32.652	7.1	145- 0
71	11	30	800	32.649	7.0	145- 0
71	11	30	900	32.659	7.1	145- 0
71	11	30	1000	32.662	7.1	145- 0
71	11	30	1100	32.647	7.0	145- 0
71	11	30	1200	32.655	7.1	145- 0
71	11	30	1300	32.656	6.9	145- 0
71	11	30	1400	32.619	6.9	145- 0
71	11	30	1500	32.659	7.0	145- 0
71	11	30	1600	32.593	6.9	145- 0
71	11	30	1700	32.654	6.9	145- 0
71	11	30	1800	32.654	6.9	145- 0
71	11	30	1900	32.656	6.9	145- 0
71	11	30	2000	32.657	6.9	145- 0
71	11	30	2100	32.656	6.9	145- 0
71	11	30	2200	32.655	6.8	145- 0
71	11	30	2300	32.655	6.8	145- 0
71	12	1	0	32.663	6.8	145- 0
71	12	2	0	32.660	6.8	145- 0
71	12	3	0	32.660	6.8	145- 0
71	12	4	0	32.648	7.0	145- 0
71	12	5	0	32.644	6.8	145- 0
71	12	5	1518	32.658	7.1	143-40
71	12	5	1935	32.653	7.0	142-40
71	12	6	215	32.646	7.0	141-40
71	12	6	515	32.631	6.9	140-40
71	12	6	845	32.644	7.1	139-40
71	12	6	1130	32.674	7.6	138-40
71	12	6	1520	32.667	7.8	137-40
71	12	6	1845	32.655	8.0	136-40
71	12	6	2230	32.590	8.1	135-40
71	12	7	140	32.618	8.3	134-40
71	12	7	500	32.639	8.5	133-40
71	12	7	745	32.534	8.6	132-40
71	12	7	1140	32.572	8.5	131-40
71	12	7	1435	32.556	8.7	130-40
71	12	7	1810	32.516	8.6	129-40
71	12	7	2120	32.395	8.3	128-40
71	12	8	35	32.390	8.5	127-40
71	12	8	350	32.292	8.4	126-40
71	12	8	600	31.135	8.9	126- 0
71	12	8	715	31.659	8.9	125-32

OCEANOGRAPHIC DATA OBTAINED ON CRUISE P-71-9

(C.O.D.C. REFERENCE NO. 02-71-009)

SURFACE TEMPERATURE AND SALINITY OBSERVATIONS

(P-71-9)

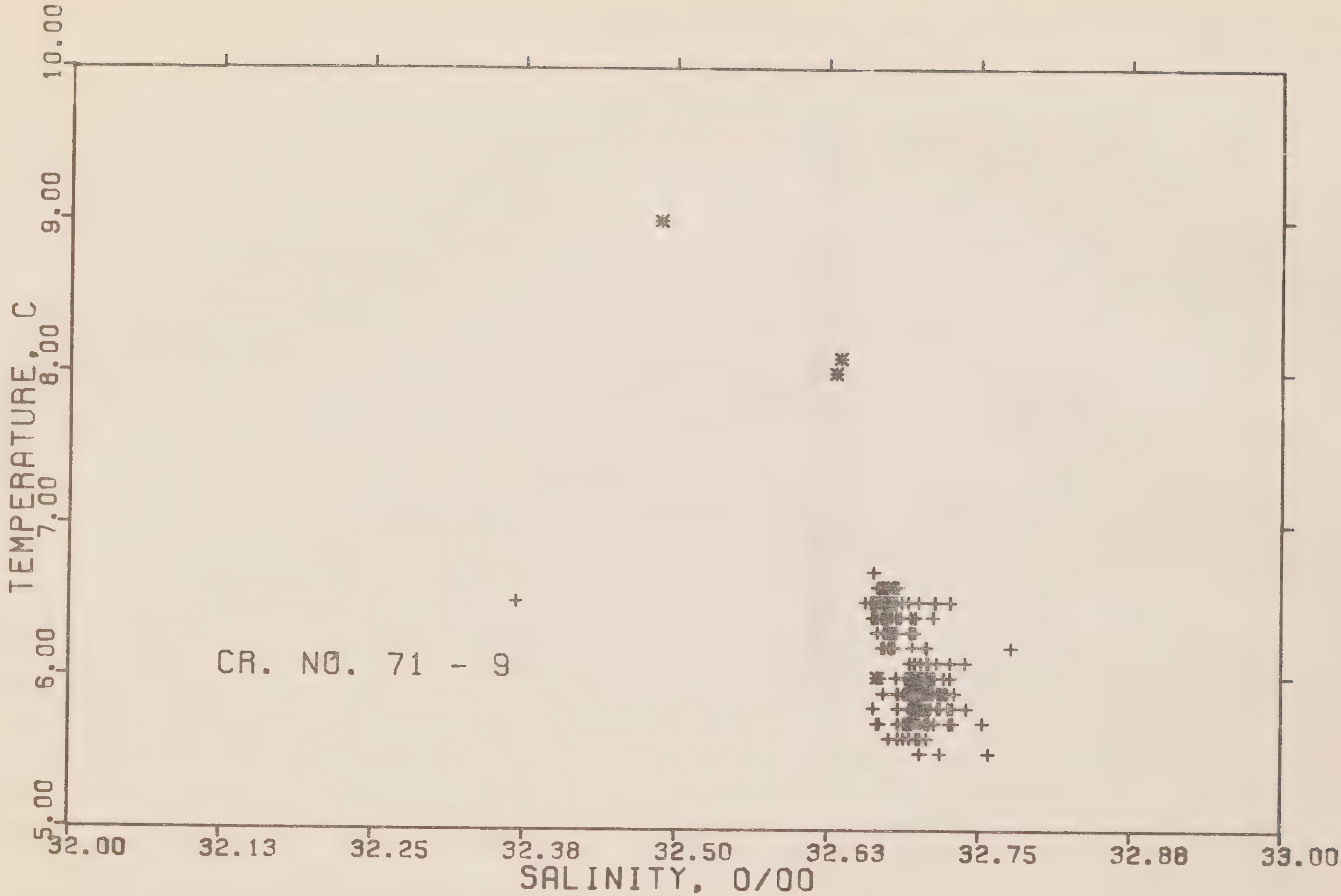


Fig. 21 T-S plot of surface temperature and salinity observations on Line P (asterisks) and at Station P (pluses) during Cruise P-71-9.

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME YR	MO	DY	GMT	SALINITY 0/00	TEMP C	LONGITUDE WEST
71	12	3	2345	32.282	0.0	125-33
71	12	4	0	32.208	0.0	126- 0
71	12	4	0	32.215	0.0	126-40
71	12	4	0	32.290	0.0	127-40
71	12	4	905	32.463	0.0	128-40
71	12	4	1500	32.487	9.0	130-40
71	12	4	2045	32.495	0.0	132-40
71	12	5	0	32.538	0.0	134-40
71	12	5	845	32.631	8.0	136-40
71	12	5	1230	32.635	8.1	138-40
71	12	5	1735	32.630	0.0	140-40
71	12	6	150	32.641	0.0	142-40
71	12	11	900	32.666	6.6	ON STATION
71	12	11	1800	32.670	6.6	ON STATION
71	12	11	2100	32.661	6.5	ON STATION
71	12	12	0	32.672	6.5	ON STATION
71	12	12	300	32.668	6.5	ON STATION
71	12	12	600	32.661	6.5	ON STATION
71	12	12	900	32.671	6.4	ON STATION
71	12	12	1200	32.665	6.5	ON STATION
71	12	12	1500	32.369	6.5	ON STATION
71	12	12	1800	32.670	6.5	ON STATION
71	12	12	2100	32.656	6.5	ON STATION
71	12	13	0	32.666	6.3	ON STATION
71	12	13	300	32.685	6.4	ON STATION
71	12	13	600	32.662	6.4	ON STATION
71	12	13	900	32.674	6.4	ON STATION
71	12	13	1200	32.665	6.5	ON STATION
71	12	13	1500	32.661	6.5	ON STATION
71	12	13	1800	0.0	6.6	ON STATION
71	12	13	2100	0.0	6.6	ON STATION
71	12	14	0	0.0	6.7	ON STATION
71	12	14	300	32.668	6.6	ON STATION
71	12	14	600	32.666	6.3	ON STATION
71	12	14	900	32.681	6.3	ON STATION
71	12	14	1200	32.677	6.3	ON STATION
71	12	14	1500	32.676	6.2	ON STATION
71	12	14	1800	32.674	6.4	ON STATION
71	12	14	2100	32.681	6.5	ON STATION
71	12	15	0	32.714	6.5	ON STATION
71	12	15	300	32.726	6.5	ON STATION
71	12	15	600	32.673	6.5	ON STATION
71	12	15	900	32.663	6.4	ON STATION
71	12	15	1200	32.697	6.4	ON STATION
71	12	15	1500	32.676	6.4	ON STATION
71	12	15	1800	0.0	6.8	ON STATION
71	12	15	2100	32.665	6.5	ON STATION
71	12	16	0	32.712	6.4	ON STATION
71	12	16	300	32.666	6.6	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	12	16	300	32.666	6.6	ON STATION
71	12	16	600	32.668	6.5	ON STATION
71	12	16	900	32.663	6.5	ON STATION
71	12	16	1200	32.678	6.5	ON STATION
71	12	16	1500	32.671	6.5	ON STATION
71	12	16	1800	32.671	6.6	ON STATION
71	12	16	2100	32.663	6.7	ON STATION
71	12	17	0	32.678	6.5	ON STATION
71	12	17	300	32.675	6.5	ON STATION
71	12	17	600	32.671	6.4	ON STATION
71	12	17	900	32.673	6.4	ON STATION
71	12	17	1200	32.682	6.4	ON STATION
71	12	17	1500	32.666	6.4	ON STATION
71	12	17	1800	32.664	6.4	ON STATION
71	12	17	2100	32.672	6.4	ON STATION
71	12	18	0	32.686	6.5	ON STATION
71	12	18	300	32.679	6.5	ON STATION
71	12	18	600	32.681	6.6	ON STATION
71	12	18	900	32.674	6.6	ON STATION
71	12	18	1200	32.683	6.6	ON STATION
71	12	18	1500	32.678	6.4	ON STATION
71	12	18	1800	32.682	6.5	ON STATION
71	12	18	2100	32.692	6.5	ON STATION
71	12	19	0	32.664	6.5	ON STATION
71	12	19	300	32.694	6.4	ON STATION
71	12	19	600	32.682	6.5	ON STATION
71	12	19	900	32.700	6.5	ON STATION
71	12	19	1200	32.677	6.3	ON STATION
71	12	19	1500	32.672	6.3	ON STATION
71	12	19	1800	32.674	6.3	ON STATION
71	12	19	2100	32.670	6.4	ON STATION
71	12	20	0	32.676	6.3	ON STATION
71	12	20	300	32.676	6.4	ON STATION
71	12	20	600	0.0	6.4	ON STATION
71	12	20	900	32.679	6.3	ON STATION
71	12	20	1200	32.693	6.3	ON STATION
71	12	20	1500	32.672	6.2	ON STATION
71	12	20	1800	0.0	6.3	ON STATION
71	12	20	2100	32.680	6.2	ON STATION
71	12	21	0	32.678	6.2	ON STATION
71	12	21	300	32.682	6.0	ON STATION
71	12	21	600	32.739	6.1	ON STATION
71	12	21	900	32.700	6.0	ON STATION
71	12	21	1200	32.705	5.9	ON STATION
71	12	21	1500	32.699	5.9	ON STATION
71	12	21	1800	32.695	6.0	ON STATION
71	12	21	2100	32.695	6.0	ON STATION
71	12	22	0	0.0	6.0	ON STATION
71	12	22	300	32.693	5.9	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	12	22	300	32.693	5.9	ON STATION
71	12	22	600	32.707	6.0	ON STATION
71	12	22	900	32.678	6.2	ON STATION
71	12	22	1200	32.697	6.3	ON STATION
71	12	22	1500	32.695	6.3	ON STATION
71	12	22	1800	32.705	6.2	ON STATION
71	12	22	2100	32.706	6.2	ON STATION
71	12	23	0	32.670	6.2	ON STATION
71	12	23	300	32.668	6.0	ON STATION
71	12	23	600	32.663	5.8	ON STATION
71	12	23	900	32.671	5.9	ON STATION
71	12	23	1200	32.698	5.9	ON STATION
71	12	23	1500	32.758	5.5	ON STATION
71	12	23	1800	32.701	5.5	ON STATION
71	12	23	2100	32.708	5.7	ON STATION
71	12	24	0	32.710	6.0	ON STATION
71	12	24	300	32.703	6.0	ON STATION
71	12	24	600	32.698	5.8	ON STATION
71	12	24	900	32.702	6.0	ON STATION
71	12	24	1200	32.708	6.0	ON STATION
71	12	24	1500	32.700	6.0	ON STATION
71	12	24	1800	32.699	6.0	ON STATION
71	12	24	2100	32.706	6.0	ON STATION
71	12	25	0	32.726	6.1	ON STATION
71	12	25	300	32.697	6.1	ON STATION
71	12	25	600	32.715	6.1	ON STATION
71	12	25	900	32.711	5.9	ON STATION
71	12	25	1200	32.707	6.0	ON STATION
71	12	25	1500	32.707	5.9	ON STATION
71	12	25	1800	32.702	6.0	ON STATION
71	12	25	2100	32.704	6.0	ON STATION
71	12	26	0	32.726	6.0	ON STATION
71	12	26	300	32.712	6.0	ON STATION
71	12	26	600	32.713	6.0	ON STATION
71	12	26	900	32.716	5.9	ON STATION
71	12	26	1200	32.707	5.9	ON STATION
71	12	26	1500	32.707	5.9	ON STATION
71	12	26	1800	32.721	6.0	ON STATION
71	12	26	2100	32.712	6.0	ON STATION
71	12	27	0	32.706	6.1	ON STATION
71	12	27	300	32.708	5.9	ON STATION
71	12	27	600	32.710	5.8	ON STATION
71	12	27	900	32.728	5.8	ON STATION
71	12	27	1200	0.0	5.7	ON STATION
71	12	27	1500	32.703	5.9	ON STATION
71	12	27	1800	32.708	5.9	ON STATION
71	12	27	2100	32.717	5.9	ON STATION
71	12	28	0	0.0	5.9	ON STATION
71	12	28	300	32.707	5.9	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME				SALINITY	TEMP	LONGITUDE
YR	MO	DY	GMT	0/00	C	WEST
71	12	28	300	32.707	5.9	ON STATION
71	12	28	600	32.701	6.0	ON STATION
71	12	28	900	32.704	5.9	ON STATION
71	12	28	1200	0.0	5.9	ON STATION
71	12	28	1500	32.704	5.9	ON STATION
71	12	28	1800	32.713	5.7	ON STATION
71	12	28	2100	32.716	5.8	ON STATION
71	12	29	0	32.705	5.7	ON STATION
71	12	29	300	32.709	5.7	ON STATION
71	12	29	600	32.740	5.8	ON STATION
71	12	29	900	32.724	5.9	ON STATION
71	12	29	1200	32.725	5.8	ON STATION
71	12	29	1500	32.700	5.8	ON STATION
71	12	29	1800	32.719	5.9	ON STATION
71	12	29	2100	32.697	6.0	ON STATION
71	12	30	0	32.702	6.1	ON STATION
71	12	30	300	32.702	6.1	ON STATION
71	12	30	600	32.698	6.0	ON STATION
71	12	30	900	32.703	5.8	ON STATION
71	12	30	1200	32.703	5.9	ON STATION
71	12	30	1500	32.722	5.9	ON STATION
71	12	30	1800	32.730	5.9	ON STATION
71	12	30	2100	32.697	6.0	ON STATION
71	12	31	0	32.704	5.9	ON STATION
71	12	31	300	32.698	5.9	ON STATION
71	12	31	600	32.700	5.8	ON STATION
71	12	31	900	32.708	5.8	ON STATION
71	12	31	1200	32.703	5.8	ON STATION
71	12	31	1500	32.692	5.7	ON STATION
71	12	31	1800	32.693	5.8	ON STATION
71	12	31	2100	32.701	5.8	ON STATION
72	1	1	0	32.693	5.8	ON STATION
72	1	1	300	32.696	5.8	ON STATION
72	1	1	600	32.694	5.7	ON STATION
72	1	1	900	32.718	5.8	ON STATION
72	1	1	1200	32.701	5.9	ON STATION
72	1	1	1500	32.695	5.8	ON STATION
72	1	1	1800	32.697	5.9	ON STATION
72	1	1	2100	32.693	6.1	ON STATION
72	1	2	0	32.712	6.0	ON STATION
72	1	2	300	32.700	6.0	ON STATION
72	1	2	600	32.696	6.0	ON STATION
72	1	2	900	32.701	5.8	ON STATION
72	1	2	1200	32.695	5.8	ON STATION
72	1	2	1800	32.698	5.9	ON STATION
72	1	2	1500	0.0	5.9	ON STATION
72	1	2	2100	32.708	5.9	ON STATION
72	1	3	0	32.699	5.9	ON STATION
72	1	3	300	32.694	5.9	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME YR	MO	DY	GMT	SALINITY 0/00	TEMP C	LONGITUDE WEST
72	1	3	300	32.694	5.9	ON STATION
72	1	3	600	32.706	6.0	ON STATION
72	1	3	900	32.776	6.2	ON STATION
72	1	3	1200	32.694	6.3	ON STATION
72	1	3	1500	32.693	6.3	ON STATION
72	1	3	1800	32.695	6.2	ON STATION
72	1	3	2100	32.691	6.0	ON STATION
72	1	4	0	32.697	6.0	ON STATION
72	1	4	300	32.698	6.0	ON STATION
72	1	4	600	32.693	5.9	ON STATION
72	1	4	900	32.707	5.9	ON STATION
72	1	4	1200	32.695	5.8	ON STATION
72	1	4	1500	32.690	5.9	ON STATION
72	1	4	1800	32.690	6.0	ON STATION
72	1	4	2100	32.692	6.0	ON STATION
72	1	5	0	32.695	6.0	ON STATION
72	1	5	300	32.696	6.0	ON STATION
72	1	5	600	32.694	5.9	ON STATION
72	1	5	900	32.708	6.1	ON STATION
72	1	5	1200	0.0	5.9	ON STATION
72	1	5	1500	32.695	5.9	ON STATION
72	1	5	1800	32.703	5.9	ON STATION
72	1	5	2100	32.695	5.9	ON STATION
72	1	6	0	32.696	5.9	ON STATION
72	1	6	300	32.701	5.8	ON STATION
72	1	6	600	0.0	5.9	ON STATION
72	1	6	900	32.703	6.0	ON STATION
72	1	6	1200	32.707	5.9	ON STATION
72	1	6	1500	32.700	5.9	ON STATION
72	1	6	1800	32.703	5.8	ON STATION
72	1	6	2100	32.703	5.9	ON STATION
72	1	7	0	32.703	5.8	ON STATION
72	1	7	300	32.707	6.0	ON STATION
72	1	7	600	32.699	5.8	ON STATION
72	1	7	900	32.699	5.9	ON STATION
72	1	7	1200	32.699	5.9	ON STATION
72	1	7	1500	32.702	5.8	ON STATION
72	1	7	1800	32.694	5.9	ON STATION
72	1	7	2100	32.700	5.8	ON STATION
72	1	8	0	32.709	5.8	ON STATION
72	1	8	300	32.702	5.8	ON STATION
72	1	8	600	32.699	6.0	ON STATION
72	1	8	900	32.704	5.8	ON STATION
72	1	8	1200	32.698	5.7	ON STATION
72	1	8	1500	32.704	5.9	ON STATION
72	1	8	1800	32.704	5.8	ON STATION
72	1	8	2100	32.698	5.8	ON STATION
72	1	9	0	32.689	5.9	ON STATION
72	1	9	300	32.700	5.9	ON STATION

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME YR	MO	DY	GMT	SALINITY 0/00	TEMP C	LONGITUDE WEST
72	1	9	300	32.700	5.9	ON STATION
72	1	9	600	32.697	5.8	ON STATION
72	1	9	900	32.753	5.7	ON STATION
72	1	9	1200	32.695	5.7	ON STATION
72	1	9	1500	32.718	5.5	ON STATION
72	1	9	1800	32.726	5.7	ON STATION
72	1	9	2100	32.701	5.6	ON STATION
72	1	10	0	32.713	5.7	ON STATION
72	1	10	300	32.684	5.7	ON STATION
72	1	10	600	32.684	5.7	ON STATION
72	1	10	900	32.692	5.7	ON STATION
72	1	10	1200	32.702	5.9	ON STATION
72	1	10	1500	32.729	5.7	ON STATION
72	1	10	1800	32.708	6.0	ON STATION
72	1	10	2100	32.694	6.0	ON STATION
72	1	11	0	32.695	6.0	ON STATION
72	1	11	300	32.695	5.9	ON STATION
72	1	11	600	32.698	5.8	ON STATION
72	1	11	900	32.694	5.7	ON STATION
72	1	11	1200	32.702	5.7	ON STATION
72	1	11	1500	32.689	5.9	ON STATION
72	1	11	1800	32.691	5.9	ON STATION
72	1	11	2100	32.702	5.7	ON STATION
72	1	12	0	32.668	5.7	ON STATION
72	1	12	300	32.693	5.6	ON STATION
72	1	12	600	32.693	5.8	ON STATION
72	1	12	900	32.666	5.7	ON STATION
72	1	12	1200	32.689	5.7	ON STATION
72	1	12	1500	32.691	5.7	ON STATION
72	1	12	1800	32.676	5.6	ON STATION
72	1	12	2100	32.688	5.6	ON STATION
72	1	13	0	32.694	5.8	ON STATION
72	1	13	300	32.707	5.6	ON STATION
72	1	13	600	32.696	5.8	ON STATION
72	1	13	900	32.694	5.7	ON STATION
72	1	13	1200	32.699	5.6	ON STATION
72	1	13	1500	32.684	5.8	ON STATION
72	1	13	1800	32.684	5.9	ON STATION
72	1	13	2100	32.684	5.6	ON STATION
72	1	14	0	32.683	5.9	144-53
72	1	14	300	0.0	5.7	144-12
72	1	14	600	32.683	5.9	143-32
72	1	14	900	32.708	5.7	143- 2
72	1	14	1200	0.0	5.9	142-23
72	1	14	1500	0.0	5.7	141-44
72	1	14	1800	32.666	6.0	140-42
72	1	14	2100	32.675	6.6	139- 1
72	1	14	2210	32.668	0.0	138-40
72	1	15	300	32.596	0.0	136-40

SURFACE SALINITY AND TEMPERATURE OBSERVATIONS
CRUISE REFERENCE NUMBER 71- 9

DATE/TIME YR	MO	DY	GMT	SALINITY 0/00	TEMP C	LONGITUDE WEST
72	1	15	300	32.596	0.0	136-40
72	1	15	600	32.654	0.0	135-21
72	1	15	1130	32.609	0.0	132-40
72	1	15	1600	32.336	0.0	130-40
72	1	15	2030	32.469	0.0	128-40
72	1	15	2300	32.192	0.0	127-40
72	1	15	1107	32.472	0.0	126-40
72	1	15	1510	31.797	0.0	126- 0
72	1	16	500	31.422	0.0	125-33

PACIFIC MARINE SCIENCE REPORT 72-3

A SURVEY OF THE USES OF REMOTE SENSING FROM AIRCRAFT AND SATELLITES IN OCEANOGRAPHY AND HYDROGRAPHY

J.F.R. Gower

Remote Sensing Consultant
To Marine Sciences Branch
Department of the Environment

Department of the Environment
Marine Sciences Branch
Pacific Region
512 Federal Bldg
Victoria, B.C.

MARINE SCIENCES BRANCH

PACIFIC MARINE SCIENCES REPORT NO. 72-3

A SURVEY OF THE USES OF REMOTE SENSING FROM AIRCRAFT AND SATELLITES IN OCEANOGRAPHY AND HYDROGRAPHY

BY

J.F.R. GOWER

REMOTE SENSING CONSULTANT

TO MARINE SCIENCES BRANCH

DEPARTMENT OF THE ENVIRONMENT

Victoria, B.C.
Marine Sciences Branch, Pacific Region
January, 1972

CONTENTS

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(c) Active Sensors

(d) Communications

I. INTRODUCTION

The developments of technology have a rapid effect on all branches of scientific research. Remote sensing of the sea is being made more attractive, scientifically and economically, by continuing improvements in space vehicles, sensors, navigation equipment and so on, whose development is most often spurred by other, often military, considerations.

Aerial photography, which has been used extensively for mapping, military surveillance, resource management and geology has been extended by the use of colour and infrared films and more recently by infrared scanners, microwave radiometers and gamma ray detectors, so that most of the accessible part of the electromagnetic spectrum can now be monitored, though with varying sensitivity,directivity and ease. This passive remote sensing can be supplemented by active methods, such as radar and lidar, which measure the response of the target to radiation.

Many properties cannot be measured remotely at all, but for those that can be measured conveniently from a satellite, for example,a world-wide picture and its day to day variation is now available to us. In other cases, development of new sensing systems has made operation from an aircraft quicker, cheaper or in other ways more desirable than work from a ship or buoy.

This report describes work from both aircraft and satellites. Sensor systems are described in more detail in their airborne applications in Section II and the various possibilities for space craft are discussed in Section III.

II. REMOTE SENSING FROM AIRCRAFT

(a) Passive sensors.

In a passive measurement the sensor receives either radiation emitted naturally by the target or solar radiation reflected from it.

(1) Optical methods using photography

Photographic film is sensitive to radiation of wavelength shorter than about 1μ (=1000 nm = 10000 Å). The recorded light intensity is often a very nonlinear representation of the true light intensity and the film is not as sensitive a light detector as a photomultiplier, but where film can be used it has the advantage of storing information very densely in a very convenient form. Colour photography provides broad band spectroscopy of the light reflected from a target,which can be extended into the infrared (see for example Scientific American article by Colwell, 1968).

In hydrography, photography has been used extensively for mapping shorelines and shoals for chart construction. Since water is partly transparent in the optical region, the exact shoreline at a given state of the tide may not be well defined on an aerial photograph. The maximum transparency for ocean water is in the wavelength band .4 - .5μ where the attenuation length is in the range 30-100 m, while closer inshore the maximum is at .5-.6μ with an attenuation length of roughly 5 m. If the shoreline is photographed with aerial infrared film which responds to .7-.9 μ, the attenuation length is less than one meter and the water/land interface becomes much more distinct.

The transparency of coastal water in the blue/green makes

shallow depth measurement possible. Anderson (1970) has investigated the possibility of mapping the 6 ft. contour (and possibly the 12 and 18 ft. contours) from the air, though measurements are complicated by varying transparency and bottom type. Vary (1969) and Helegeson (1970) have also investigated this problem. Vary (1971) has tested a colour film specially developed for this purpose.

A typical program for coastal surveying (Swanson, 1964) might involve taking a black and white infrared photograph at high tide to determine the shoreline, and a colour photograph at low tide to find shoals. An infrared photograph could also be taken to give the low water line.

Ice cover and icebergs are regularly photographed from the air. For shipping protection and routing the ice must be monitored regularly and cloud cover is a serious limitation.

Where adjacent bodies of water differ in colour, aerial photography can be used to map water circulation. This is usually possible near river estuaries where silt laden water can be easily distinguished from clearer sea water. Circulation of Fraser River water near Vancouver has been studied for evaluation of sewage disposal methods (Fjarlie, 1950) and recent examples of this work have been described by Carlson et al , 1970 and Drake et al , 1970. Simultaneous infrared photography has also been found useful here, because of its short penetration depth, to distinguish the purely surface features (Huh, 1971).

The spectrum of sunlight reflected from scattering centers up to several meters below the surface can be searched for the characteristic absorption line due to chlorophyll at .68μ. Presence of chlorophyll above 0.2 g/m^3 indicates presence of sufficient plankton to support commercially

viable fish concentration, and a map of observed chlorophyll absorption would be of great use in the fishing industry. (N.A.S. (5) Sections 3.3.3. p. 51, Clarke, Ewing and Lorenzen, 1969).

Ewing, Lieberman and Yentsch among others, have studied problems associated with chlorophyll detection. Their work and other work on ocean colour is reported in "The Color of the Ocean," 1969 (see "Books and reports" references).

Sunlight reflected specularly from the surface of the sea reaches an observer from those areas of the surface (facets) which have the appropriate slope. Cox and Munk (1954, 2 papers) have studied the glitter patterns formed by these facets using aerial photography and have derived from them the slope distribution of the surface.

Aerial photography has also been used to track currents and diffusion processes where the sea has been artificially marked with buoys or dye. (Oliffe and Varney, 1964; Assaf et al, 1971; and, for a local current survey, Keenan et al, 1966).

Internal waves at interfaces between layers of different density in the sea become visible as bands of increased roughness on the surface of water with a separation of 1000 to 3000 ft. They have been observed from the air in coastal areas where they are initiated by tidal currents. Shand (1953) shows photographs of surface bands of roughness due to internal waves in the Georgia Strait, and a study of these waves is continuing at D.R.E.P. Victoria, B.C., under Dr. H.L. Grant (Hughes, 1969).

Cameron (1962) has reported on a method that makes use of stereophotography and viewing to measure small movements of any material floating on the water surface, such as foam or ice. When making aerial surveys over land it is common to take pairs of photographs, one a short

interval after the other, and to use the stereoscopic view produced to contour the ground. If an object moves between the two exposures, it may appear higher or lower than it would if stationary. The shift can be used to estimate the motion.

Stereo photography can also be used to survey waves on the ocean surface. Over land where features are stationary, stereo pairs can be taken from a single aircraft which takes two photographs from points some distance apart; over the ocean two aircraft must be used to take simultaneous photographs at the required spacing. In SWOP (Stereo Wave Observation Project) stereo pairs of photographs of an area 2700 ft. x 1800 ft. of the open ocean surface were used to obtain 5400 simultaneous spot heights on a square grid with 30 ft. spacing. The two dimensional wave spectra with 180^{0} direction ambiguity were then calculated digitally (Coté et al, 1960; see also Kinsman, 1965 for a summary of this project).

Useful information on wave state can also be extracted from aerial photography by analogue Fourier transformation using a"holographic" technique. A suitably processed transparency of the photo diffracts a plane parallel light wavefront. Straight parallel wavecrests in the photograph diffract light through an angle depending on the wavecrest separation. The complex diffraction gives information on the two dimensional wave spectrum (Uberoi, 1962).Noble (1970)has used an analogous technique for satellite photographs.

(2) Infrared (wavelength longer than 1μ) and ultraviolet sensing.

Semiconductor infrared sensors are now available that are extremely sensitive for the wavelength range from 1μ to millimeter wavelengths.

A black body at $300^{o}K$ radiates its peak energy/unit wavelength interval at about 10μ. The cloudfree atmosphere has "windows" (transparency greater than 50%) in the near ultraviolet,optical and near infrared at 0.3 - 1.3μ and from 1.4 to 1.9μ, 2.0 to 2.6μ, 3.0 to 4.1μ, 4.4 to 5.0 and 8.0 to 13.5μ. Beyond 14μ the attenuation is very large up to wavelength greater than 1000μ. During the day the infrared radiation of wavelength less than 3μ from a target would be mostly reflected sunlight; only in the 8 to 13.5μ band do infrared pictures taken during the day indicate target temperature. Cloud and even slight haze can absorb infrared radiation very strongly, depending on the total water or water vapour content of the air.

Infrared viewing systems may be simple radiometers (airborne radiation thermometers - A.R.T.) or may scan in either one dimension (scanners) or in two dimensions (usually called 'imagers') which can take a 'TV type' picture from a stationary or moving vehicle.

A typical infrared scanner uses a single sensor whose instantaneous view of the ground or sea surface defines the resolution limit of the instrument. This field of view is moved from side to side, usually by a rotating mirror, while the forward motion of the aircraft advances it in the other coordinate, so that the sensor scans a strip under the aircraft. The sensor is usually a cooled semi-conductor giving an electrical output varying with the incident radiation level. Radiation is focussed on to the sensor by a telescope with a dielectric interference filter to limit the incoming radiation to wavelengths of low atmospheric absorption. The electrical signal from the sensor is converted to a picture on a cathode-ray tube and may also be stored on video tape or photographic film. Electronic processing may be used to counteract movements of the aircraft and

compensate for the longer path length in air for observations off nadir. For accurate quantitative measurements correction must also be made for the total absorption based on a model atmosphere. Radiation collected by such a scanner system can be shared between many detectors, and in satellites (Section III) separate scanner outputs may give pictures in several optical bands using photomultipliers as well as infrared bands. For a review of scanning devices see Lowe, 1968 and for an example of current state of the art see Zaitzeff et al, 1971. For articles on infrared detectors see Holter and Legault, 1965 and Klein, 1971.

The scanning principle can easily be applied to the near ultraviolet (0.3μ to 0.4μ) using a photomultiplier as the sensing element. Lowe and Hasell(1969) used multispectral scanners between 0.32 and 1.4μ to observe an oil slick, and found that it stood out particularly well in their band from 0.32 to 0.38μ.

For measuring temperatures from the air, the window between 8 and 13.5μ is commonly used. Absorption in this window is slightly less than that in the visible (25% absorbed as against 40%, computed for a vertical path through the whole atmosphere) though clouds absorb at least as strongly as in the visible. A scanner operating from an aircraft at this wavelength will sense the temperature of the top 10μ of the sea's surface, this being the approximate attenuation length at this wavelength. Because of the low dielectric constant in the infrared (about 2) less than 2% of incident infrared radiation is reflected. The emissivity of the sea's surface is thus 98%. Pictures taken with infrared scanners can show the water temperature of the thin (less than 10μ) surface layer. Sudden temperature discontinuities are particularly easy to record and pictures of

convection cells, wind streaks and breaking waves have been published (McAllister & McLeish, 1965) and the boundary of the Gulf Stream near the U.S. Coast has been extensively surveyed (Pickett, 1968, Wilkerson and Noble, 1969; Curtis and Rao, 1969).Saunders (1967 (a),1967(b) and 1968) and Saunders and Wilkins (1966) have studied the accuracy that may be attained in making sea surface temperature measurements from the air with an A.R.T. Saunders (1967) has tested a normal/oblique viewing method which he finds can give an absolute accuracy of $\pm$ 0.2°C. More recently he has described measurements using only normal viewing and methods of correcting them to the same absolute accuracy of $\pm$ 0.2°C (Saunders, 1970).

If two different infrared bands are used for which sea water differs greatly in opacity, the measured temperatures will be those appropriate to averages through different depths of water. By observing in two bands simultaneously and comparing the two temperatures observed, an estimate can be made of the temperature gradient of the sea surface. This temperature gradient is a measure of the heat lost by the surface providing that conduction is the primary mechanism. McAlister and McLeish, 1965, observing at 2.0 to 2.4 and 3.5 to 4.0μ (where 50% of the radiation is absorbed in 400μ and 50μ respectively) were able to measure temperature differences between 0.1 and 0.2°C that agreed with the estimated heat lost for the conditions prevailing. More recent work with this system from an aircraft using a digital on-line data reduction system has given an accuracy of $\pm$ 0.003°C for the temperature difference between bands 3.4 to 4.1, and 4.5 to 5.1μ (McAlister, McLeish and Corduan, 1971). The accuracy of water temperature measurements was reported as $\pm$ 0.01°C, though more tests are probably needed to confirm this. Variation in sea state did not appear to

affect the results.

The thin surface layer, whose temperature is measured with an airborne radiation thermometer,will be cooler and more saline that the sea water immediately below it as a result of evaporation and thermal radiation, though precipitation may temporarily reverse this. The dynamics and other properties of the surface layer have been discussed by by Katsaros (1969).

McLeish (1970) discusses the small scale spatial variations in surface temperature observed with an A.R.T. and concludes that these are caused by slicks of oil and other organic material whose distribution reflects the turbulence in the upper layer of the ocean.

(3) Microwave sensing.

Microwave sensors have the great advantage of "all weather capability", but suffer from resolution limits due to the comparatively long wavelengths involved. Beam widths measure usually not less than $1^{o}x1^{o}$, which at 3 cm implies an antenna nearly 2 meters across. In order to produce a raster pattern the response must be scanned from side to side sufficiently fast to leave no unobserved areas on the ground between scans. For an aircraft flying at 1000 ft. a 1^{o} beam will cover an area of about 16ft. across on the ground, so that for an aircraft travelling at 400 ft./sec. the scan can only last 1/25 second. Such rapid motion implies an electronically scanned array (Louapre, 1968) unless only a single strip beneath the aircraft is to be surveyed.

Energy emitted by a black body at $300^{o}K$ falls off rapidly below infrared frequencies, but microwave radiometers can be made sufficiently sensitive to measure the small amount of radiation remaining. For the above

example at a wavelength of 3 cm, the radiometer might be required to measure temperature to an accuracy of $1^{o}K$ in 1 msec. and would therefore have to have a ratio of noise-temperature ^{2} (^{o}K), to bandwidth (Hertz) of 1 to 4000, for example $100^{o}K$ and 40 MHz. Such parameters probably represent the approximate state of the art (Ewen et al, 1968).

At these long wavelengths water has approximately its DC dielectric constant of about 84, a value which in the absence of conductivity losses implies an emissivity of about 0.35. At frequencies below 100 MHz the conductivity causes this value to drop still lower.

A radiometer operating at wavelengths longer than 2 cm pointing vertically down at sea water at $280^{o}K$ will therefore indicate a temperature of only about $100^{o}K$. At shorter wavelengths atmospheric absorption increases and raises the apparent temperature to $135^{o}K$ at 1.55 cm, and $150^{o}K$ at 0.85 cm (Stogryn, 1967). The exact value of this low measured temperature is very sensitive to the emissivity of the surface. Actual temperature measurements of the sea are therefore more difficult, though experiments indicate that an accuracy of $\pm$ 1-$2^{o}K$ may be possible.

Measurements of the emissivity variation due to changing wave state, leading to wind speed measurements have been proposed by several authors. The observed temperature is predicted to be most sensitive to the wave state at inclination angles of about 50^{o} (Stogryn, 1967) where the observed temperature should increase by 1 to $2^{o}K$ for each m/sec. of wind velocity. This prediction has been checked by Hollinger (1970 and 1971) and by Nordberg et al (1968) whose results confirm the increase in emissivity with wind speed, but disagree with the theory in many respects. Predictions are complicated by the effects of capillary roughness on top of gravity waves and by the high emissivity of any foam present on the surface

(Williams, 1969; Droppleman, 1970(a); Ross et al,1970; Auckland et al, 1971).

Ice has a much higher emissivity than does water, although the exact value of this and other properties vary with the age and past history. At microwave frequencies the dielectric constant is about 3.5 with a loss tangent of about 0.1 to 0.3 giving an emissivity of about 0.91 and observed temperatures between 200 and 250^{o}K. Contrast between ice and water will therefore be very high, and passive microwave radiometry can easily be applied to all weather ice surveillance, though with low spatial resolution.

Ice thickness measurements may also be possible. For a loss tangent of sea ice of 0.1, radiation would penetrate about 0.85 of its free space wavelength before being reduced in intensity by a factor of 1/e. Because of the long wavelengths involved, this implies that a microwave radiometer will be sensitive to subsurface temperature in the ice, down to a depth of a few tens of centimeters for microwave radiation near 1.5GHz. For very thin ice over sea water, a microwave radiometer will indicate a very low temperature, tending towards the 100^{o}K mentioned above for water alone as the ice thickness tends to zero. For thicker ice, the observed temperature will tend to the 200 to 250^{o}K figure for ice alone. It is difficult to predict what thickness discrimination is possible, since the method will be sensitive to surface and conductivity differences of different areas of ice. Older, less salty ice, for example, will provide lower attenuation to radio waves. Investigations of this method are being carried out in Canada by Hartz (1970), whose initial results suggest that temperature differences due to ice up to 5 ft. in thickness can be detected; and also in the US (USNOO/NASA report).

Microwave radiometers may also be useful in detecting and monitoring oil slicks on water. Oil changes the reflectivity of the water surface and also damps out capillary waves. Both these effects change the microwave temperature observed.

Droppelman (1970 b)reports airborne measurements with a microwave radiometer which show the predicted reflectivity change in the water surface due to the salinity change at the mouth of the Mississippi.

(4) Other passive sensors.

Gamma rays have been used for geological surveys from the air, but in oceanography have only been used for shipboard tracing of water bodies tagged (usually inadvertantly) by radionucleides.

The magnetic field variations caused by motion of the (conducting) sea water in the earth's magnetic field, can be measured and used to determine the wave spectrum. The variations also form a noise-like background which, together with ionospheric micropulsations, hinder the airborne detection of magnetic anomalies due to submerged submarines. The effect has been discussed by Maclure et al (1964) Warburton and Caminiti (1964) and Weaver (1965). Baker and Graefe (1968) have used an airborne magnetometer for measuring ocean wave profiles and spectra by flying at 100 ft. above the water, well away from the magnetic bottom (i.e. in deep water) and measuring fields to 0.03 nT (compared to the earth's 4×10^4 nT). The method appears capable of detecting waves with periods between 10 and 30 seconds.

(b) Active sensors.

(1) Radar.

Active microwave sensing (radar) has four types of uses in oceanography Scatterometry -- measurements of roughness of the sea surface, altimetry, high resolution mapping and Doppler measurements.

i. Scatterometry.

Wave clutter due to reflections from waves is a limiting factor in detecting nearby objects with shipborne radar. The clutter contains statistical information about the waves and several airborne radar systems have been developed to investigate what properties of the wave state can be determined. In an early experiment the fraction of returned power for an airborne radar directed downwards, 2^{o} below the horizontal, has been found to increase by a factor of about 16 between sea states 1 and 4 (Katz, 1965). Returned power over a greater range of depression angles and directions (upwind/downwind) has been analyzed by Marks (1965).

Moore (1968) has developed a scatterometer using frequency analysis of the reflected pulse. The radar beam is 120^{o} wide fore-and-aft and 3^{o} wide side to side. The varying doppler shift allows reflections from different parts of the beam to be separated. It is also possible to use the different travel times for radiation which left the antenna in different directions to make this separation (Moore, 1966). Possibilities for these systems over a range of different radio frequencies are being investigated (USNOO/NASA report, Krishen, 1971).Guinard et al (1971)and Valenzuela, Laing and Daley (1971) have reported on extensive research using the Naval Research Laboratory's 4 frequency radar (4FR) from an aircraft and have used their results together with predictions of the radar cross section, to derive the ocean wave spectrum for sea wavelengths between 0.3 and 11 cm. The scattering theory is based on the resonance

principles described later in subsection v.

ii. Altimetry

A pulsed downwards looking radar gives range information as well as wave state information. Such radar altimeters can be used to give information about very long waves if the aircraft motion is sufficiently well known, but its ability to measure shorter waves is limited by the area of sea illuminated by a single pulse (Barnett & Wilkerson, 1966; Yaplee et al, 1971).

Accurate altimetry, together with an accurate inertial navigation system may make possible measurements of large scale distortion of the ocean surface due to weather systems or to currents, tides and bottom features. (see the discussion for spacecraft in Greenwood et al, 1969 - 2 papers).

iii. Radar mapping

High resolution radar pictures can be made for mapping and ice surveillance purposes using sideways looking airborne radar (SLAR). In the sideways looking configuration, a long antenna is mounted down the side of the aircraft to give high resolution in the along track direction, i.e. 200 ft. at 5 miles, 2000 ft. at 50 miles. Output can be recorded by using the returned pulse power with compressed dynamic range to modulate a moving light spot which is then photographed on a continuously moving film strip. The strip of ground mapped might be 50 miles wide and several hundred miles long and can be combined with parallel strips to cover large areas (see general reference Kiefer and Scherz, 1970).

Synthetic aperture, or fully focussed SLAR, uses the principle of aperture synthesis. Here observations of a stationary scene

made at different times with a moving antenna are combined to give a much higher along track resolution than the beam width of this antenna would allow. This increase is such that the resolution becomes independent of range and might be 50 ft x 50 ft. to the range limit of the instrument. The technique implies use of coherent radiation and considerable analogue signal processing equivalent to a one dimensional Fourier transform. The aircraft must fly a straight course, though some electronic correction for a curved flight path is possible. Ultimate resolution along the track is half the antenna length at any range. Either real or synthetic aperture SLAR can be used for all weather ice surveillance (Johnson and Darmer, 1971) or coastline mapping. Return intensity over the open ocean may also give high resolution information on wave state.

For a review of SLAR types and uses see NAS 1969 (6) Sensors and Data systems. (See "Books and reports" references).

iv. Doppler Radar navigation

Doppler radar is the basis of the doppler navigation system used on many aircraft, though now being replaced by the inertial navigation systems (I.N.S.). These radar systems operate near 9 or 13 GHz and compare the doppler shifts of returns from four beams (left and right forward, left and right backward) to get the ground velocity vector of the aircraft. Over the sea the measured velocity vector will be affected by motion of the water surface caused by currents, wind and waves. If the exact course of the aircraft can be determined by other means (for example using INS) then the course measured by doppler radar will give a measure of surface drift. A standard relation for the wind drift that is observed with a doppler radar navigation unit is 1.28 $V_w^{1/3}$ knots,

where V_w is the wind velocity in knots. It should be possible to separate the effects of at least the larger, near-shore currents from this, although waves and resonant scattering (see next subsection) will also have an effect.

v. Resonant Doppler radar returns

The radar returns from a random surface such as that of the sea will be dominated by the signals from scattering centres placed so as to give a coherent build-up of scattered power in the direction of the receiver. At grazing incidence, for a monostatic arrangement (i.e. using the same antenna to transmit and receive), this return will be due to that component of the water wave spectrum having a wavelength equal to half the radar wavelength (for the first-order resonance), and a direction of propagation directly away from or towards the radar. These water waves will have a characteristic phase velocity and hence cause a characteristic doppler shift of the return signals.

The effect is especially marked at low radio frequencies where the resonance is with the longer, more dominant, water waves. Crombie (1955) found that by far the strongest component of sea clutter return from coherent radar signals at 13.56 MHz had a doppler shift of 0.38 Hz compared to the expected value for this resonance of 0.376 Hz. Sofaer (1958) found that the resonant, doppler shifted return near 50 MHz caused rythmic fading on broadcast TV receivers near the coast. Early Russian work is described in Braude (1966) and in later work Bass et al (1966) summarize the result that the doppler shifts for radio frequencies from 1.5 to 10,000 MHz agree with the predicted values. At the higher frequencies, however, the effect is masked by motion due to longer waves and wind (see for example work done by Melnichuk and Chernikov, 1971 at 10GHz and by Wright and Keller, 1971, in the laboratory). Crombie (1971) has used a broad band radar system

operating between 1.7 and 12.37 MHz in an experiment to measure the ocean wave spectrum from the shore out to a distance of about 100 km. He was able to resolve the return doppler spectrum to 0.002 Hz and found components (typically 0.04 Hz wide at 8 MHz) returned from both advancing and receding waves. Using the theory of Wait (1966) he related the observed return intensity to the wave spectral density and found good agreement with simultaneous aircraft measurements of the wave spectrum. His results also show that the equipment can be used to measure sea currents.

Peterson, Teague and Tyler (1970) have used Loran A signals at 1.35 MHz to make bistatic radar measurements with the receiving antenna a long distance from the transmitting station, to measure some components of the wave spectrum out to about 140 km from the shore.

(2) Lidar (Radar-type measurements using a light source).

i. Laser Profilometer

To measure the detailed wave profile below an aircraft, a laser system can be used in which a very small area of the sea is illuminated at any one time. A pulsed laser would give gaps along the flight path so an amplitude modulated CW laser is usually used. The laser wave profiler described by Olsen and Adams (1970) can give an accuracy of 1.5 cm flying at a height of 60 m. The laser illuminates a spot 2 cm across and can measure height with a time constant of about 50μ sec. The lidar can therefore give a complete measurement of the gravity wave profile from which the statistical properties can be calculated later. Schule et al (1971), Ross et al (1970) describe the use of such an instrument.

ii. Laser water depth measurement

A suitably designed pulsed lidar system can detect the return from the bottom of shallow water as well as the return from the surface. Hickman et al (1969) describe the use of an airborne system based on a blue/green laser, that can measure depths up to about 30 ft. This limit depends very strongly on the water turbidity and the nature of the bottom. (See also Hickman and Hogg, 1969).

iii.Spectrometry of the lidar return.

Laser light, scattered elastically from a target, will be received at the same, transmission frequency. A very small doppler shift can be observed for a target moving at aircraft velocities if a frequency stabilized laser is used. It is planned to make use of this shift in the design of an airborne mapping lidar being developed by RCA on a contract with the Canadian Centre for Remote Sensing (Report Reference 4, report 10).

Light may also be scattered inelastically. A molecule in the target can interact with the light to give up or take in energy, usually a quantum of rotation or vibration. The weak frequency shifted components form the Raman spectrum of this molecule and can be used to identify it and estimate its relative abundance.

The lidar system described by Dr. Carswell of York University in Report reference 4, report no. 10, is designed to study either elastic or Raman scattering from atmospheric constituents or pollutants.

A stronger interaction occurs when a high energy photon is absorbed by a molecule, and the energy is subsequently reemitted in transitions at longer wavelengths. An ultraviolet laser can stimulate fluorescence in this way in many materials of interest in oceanography.

Oil films and dyes fluoresce strongly, and the organic content of sea water gives a weaker effect. An airborne fluorosensor is being developed by Dr. Measures of the University of Toronto (Report Reference 4, report no. 10) and should be useful for pollution studies, and also for tracking dye patches in the sea to measure diffusion and currents.

III. REMOTE SENSING FROM SATELLITES

(a) Introduction.

Many of the sensors used in aircraft can also be used in satellites. The satellite provides less space, power and weight capability for the sensor and has a vastly greater capital cost than an aircraft. It is also further away from the surface of the ground or ocean and therefore less capable of measuring fine details.

The importance of the satellite in oceanography lies in its ability to survey large areas rapidly so as to provide, for the first time, almost simultaneous pictures of the state of an entire ocean. If sensors can be built to measure oceanographic and meteorological data sufficiently accurately, then predictions of the future behaviour of an ocean, as well as greatly improved and longer term weather forecast, should be possible.

This section of the report deals with satellite measurements in physical oceanography. Meteorological satellites also provide necessary data (atmospheric soundings, pictures of cloud cover and weather systems) but are not discussed here.

From satellite altitudes (125 nm minimum, 5-600 nm typical for earth resources satellites, 22,800 nm for synchronous satellites) the fine detail on the surface of the earth at a scale of less than 100 meters becomes difficult to observe. For most oceanographic purposes this is not a serious limitation. More important is the fact that radiation received has passed through the entire thickness of the atmosphere. Clouds are opaque to the infrared as well as the visible light and accurate temperature measurements will be affected by the exact value of the atmospheric absorption.

The chance of any one vertical line of sight being cloudfree is about 40 to 50% on average, while the chance of observing a cloudfree area becomes increasingly smaller with the size of the area (see Graves, Sherr and Glaser, 1970, for a discussion of cloud cover statistics).

A summary of possible oceanographic sensors for use in spacecraft is given in the joint USNOO/NASA report. Most of the aircraft techniques can be adapted to use in satellites but the value of such a move has to be carefully considered in each case. The report lists uses of photography and other passive imaging devices as well as radar and lidar. Special purpose spectrometers for detecting particular molecules have also been suggested.

An additional problem in satellite work is the transmission of the collected data to earth. Only in special cases where high resolution (and perhaps secrecy) are required is it worth the expense of actually returning photographic film to the ground. In all earth resource satellites, weather satellites, etc. pictures are transmitted to the ground by television links of varying degrees of resolution. The manned Skylab A planned for April 1973 will carry an Earth Resources Experiment Package (EREP) as a follow-up to the ERTS-A satellite. Photographs, line scan and other output from EREP will be carried back to earth by each of the 3 crews who will visit the Skylab.

Pictures for retransmission are recorded by either vidicon tubes or spectral scanners. The earth resource satellite, ERTS-A will use both these techniques. Vidicon tubes will take pictures through blue/green, red and near infrared filters (.475 to .575μ ,.58-68μ , .69-.830μ). Each picture will cover a 180 km square area on the ground and will be transmitted as intensity measurements in 4200 x 4200 elements. The predicted

ground resolution is about 100 m. A spectral scanner will scan the same strip of ground, 180 km wide, through a telescope, and have about the same resolution. Light received by the telescope is focussed on sensors receiving 4 bands at .5-.6μ , .6-.7μ , .7-.8μ and .8-1.1μ. Earlier satellites (Tiros, Nimbus, ATS and ESSA series) designed for meteorological purpose have also transmitted pictures using these techniques in the visible and infrared, but with much lower spatial resolution (NASA, 1970).

The following is a summary of satellite applications in oceanography taking types of sensors in roughly the same order as in the previous section for aircraft.

(b) Passive sensors.

(1) Pictures in the visible and near infrared (.4-1.1μ)

Pictures with 100 meters resolution may be useful for large scale mapping of coast lines but in most cases the greater resolution of aircraft surveys will be required. For surveying ice and icebergs on the sea a satellite with its capability for making regular observations is extremely useful, but coverage is limited by cloud cover. For observations of snow and ice however, the effects of cloud can be greatly reduced by mapping the "composite minimum brightness" (CMB) over, say , a 5-day period. A computer selects the minimum brightness observed for a given ground location in several days of observations from a sun-synchronous satellite. In areas covered by ice or snow and in the few areas always cloud covered during the 5 days, this minimum will be relatively high. McLain (1969, General reference), has presented a series of 5-day CMB pictures of the Canadian Arctic showing receding ice and snow during the summer.

Colour pictures from space have shown some details of the sea bottom, particularly in clearer water near islands in mid-ocean and some useful depth measurements may be made. The telemetered pictures from ERTS-A will have 3 and 4 channel colour information which can be processed to give the best combination for mapping underwater topography or for tracking silt laden water against a background of sea water.

There has been discussion of glitter patterns visible on some satellite pictures and their use as an indicator of wave state and wind velocity (Martin, 1969; Strong and Ruff, 1970; Levanon, 1971). The sun's image reflected in the sea can cover a fairly compact area under calm conditions, or may be spread over a considerable area by rough seas. Approximate measurements corresponding to a few meters per second of wind speed up to a maximum of 15 m/sec. may be possible with this method, but the result is often an average over a rather large area (several hundred kilometers in diameter).

Astronaut Glenn in the MA-6 flight reported being able to see the Gulf Stream, possibly because of the different wave state in the current itself. Variations in texture due to such currents and possibly also due to internal waves, may be visible with 100 m resolution (Lowman 1965).

Analysis of an Apollo 7 photograph using an optical Fourier transformation process (Noble, 1970) was able to detect swell with a wavelength of 360 meters that had decreased by 5 to 10% in shallow water. Some ERTS pictures might show swell patterns, but all but the longest wavelength would be at or near the limit of resolution.

(2) Pictures in the thermal infrared 2-14μ)

Such pictures can show the temperature of the surface in those areas unobscured by cloud or haze. Absolute temperature measurements are difficult, but relative temperature changes of about $1^{o}C$ can be measured with simple sensors now in operation; for example, the radiometers on the Tiros series and the high (5 nm) and medium (30 nm) resolution infrared (HRIR and MRIR) scanners and the IRIS spectrometer on the Nimbus series (Glaser et al, 1965; Sabatini, 1969; Conrath et al, 1970).

Corrections for the effect of atmospheric absorption on the observed temperature can be made by considering atmospheric models. Computerized methods have been devised to automatically reject temperature readings that are affected by clouds, and to correct and plot out the remainder (Anding and Kauth, 1970; Smith et al, 1970; Shank and Salomonson, 1970; Vukovich, 1971).

Such large scale temperature maps of the ocean surface are now available. Their accuracy and coverage are still limited by cloud but can still be extremely useful in weather forecasting for estimating the heat transfer between the ocean and the air.

Ocean currents can also be followed using their temperature difference from surrounding water, as from aircraft (Warnecke et al, 1971; Rao et al, 1971).

(3) Microwave observations

The "All weather" potential of microwave sensors is an even greater advantage in a satellite, but the lower resolving power becomes even more of a problem. The bulky (10 ft.) antenna needed to give a 1^{o} beam

at 3 cm wavelength will only give a resolution of 10 miles on the ocean surface for a 600 miles altitude, though for surface temperature mapping this is probably sufficient. Suggested radiometers operate at shorter wavelengths than this (down to 1 cm), but then are more affected by clouds. The low emissivity of water is probably the most serious limitation to microwave sea surface temperature measurements. The problems of separating effects due to the wave state from effects due to varying sea surface temperature have been discussed by Williams (1969). Russian experiments in Cosmos 243 using microwave radiometers at 0.8, 1.35, 3.5 and 8.5 cm wavelengths are reported to give sea surface temperatures to better than $\pm 2^{o}K$ (Basharinov et al, 1971).

Ice cover, due to its high contrast with water, would be easy to distinguish but the low resolution would again give only a very broad picture. Areas of broken ice would give an intermediate temperature depending on the fraction of surface covered, but ice only a few millimeters thick (for an observing wavelength of 3 cm) would be indistinguishable from very much thicker ice.

(4) More specialized sensors.

The chlorophyll survey described in section II (a) (4) may also be possible from a satellite (N.A.S. (5)),using the absorption line at 0.68μ.

Observations from meteorological satellites at frequencies near absorption lines of CO_2 (Smith, Woolf and Jacob, 1970) and H_2O (Gurvich and Demin, 1970) are now being used to obtain temperature and water vapour profiles of the atmosphere. Such observations are analogous to the heat flux (temperature profile) measurements of McAllister et al. for the ocean,and

will be necessary along with oceanographic measurements for following air/sea interactions.

(c) Active sensors.

Synthetic aperture sideways looking radar provides the only reasonable way round the low resolving power of microwave systems, although an active system has the disadvantage of not responding to the intrinsic black body radiation from the target. The resolution possible with such a system depends very much on the transmitter power available, but satellite systems capable of resolving 10 ft. from a slant range of 1000 km will probably be available in the next few years and there is no fundamental limit that would prevent a yet higher resolution. Such very high resolution is probably not sufficiently useful in oceanography to justify the high power requirements and the very expensive large scale data handling. Low power, low resolution systems for earth resource satellites have been suggested (N.A.S., 1969 (6)) and these could be useful for all weather ice surveillance. Here however, the economics of satellite observation against airborne systems still has to be considered. Ice surveillance is most important for main shipping lanes and these could possibly be more cheaply covered by airborne radar.

Radar altimetry from satellites over the ocean has considerable interest for measurements in geodesy and in oceanography (Greenwood et al, 1969, 2 papers; Zetler and Maul, 1971). The ocean surface takes up the local shape of the geoid except where it is distorted by weather systems, tides, currents or, on the smaller scale, waves. Accurate altimetry from satellites in an accurately known orbit could measure all of these, contributions from each being separable by suitable analysis and comparison with

other data. The beam from a radar altimeter will cover an area several miles square, so that only the longest wavelength waves will be observable directly, but a combination radar-altimeter-scatterometer (see references given earlier) could measure the average sea state beneath the satellite.

Satellites are especially suitable for these large scale altimetry measurements although the increasing accuracy of inertial navigation systems allows aircraft to be used over smaller areas.

A laser ranging system can also be considered, but here the all weather capability is missing.

(d) Communications.

One of the most useful application of earth satellites in general has been in the field of communications. Some recent and planned satellites have the ability to relay messages from instrumented stations on earth to a central data processing laboratory. Nimbus 3 and 4 have the IRLS (Instrumentation Relay and Location System) which relays readings from, for example, drifting buoys, as well as measuring their positions to within about 10 km with a pulse ranging system. The French EOLE system can interrogate up to 4000 ground stations and locate them to better than ± 1 km. ERTS-A will relay messages it receives from up to 2048 separate instrumented stations; a brief (69 bit) message should be successfully relayed from each station at least once every 12 hours.

Such relay systems will probably be useful in weather or wave forecasting in oceanography, where results are needed as soon as possible, and will also have advantages over the more traditional tape recording in other applications.

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PACIFIC MARINE SCIENCE REPORT 72-4

THE 'VANLENE' ACCIDENT

March 1972

A.B. Ages

Canada
Department of the Environment
Marine Sciences Branch
Pacific Region
512 Federal Bldg
Victoria, B.C.

1972

MARINE SCIENCES BRANCH

PACIFIC MARINE SCIENCES REPORT NO. 72-4

THE "VANLENE" ACCIDENT

MARCH 1972

BY

A.B. AGES

Victoria, B.C.
Marine Sciences Branch, Pacific Region
1972

m.v. "Vanlene" aground off
Austin Island, March 1972

(courtesy "The Victorian Weekly")

INTRODUCTION

On Tuesday evening, March 14, 1972, the 8500 ton m.v. "Vanlene" ran aground off Austin Island in Barkley Sound (fig. 1), a rugged and isolated inlet on the southwest coast of Vancouver Island and part of the new Pacific Rim National Park.

The Panamanian freighter en route from Japan to Vancouver with a cargo of 300 cars, was heading for the entrance of the Juan de Fuca Strait when she found herself on the rocks in Barkley Sound, 20 nautical miles off course. In a press interview shortly afterwards, the captain revealed that ever since her departure from Japan, the ship had been operating without any navigational aids except a magnetic compass.

Exposed to southerly seas, the 20 year old "Vanlene" was holed that same night and had to be abandoned when the engine room flooded. At the time of her grounding, there were 400 tons (2666 barrels or 112,000 U.S. gallons) Bunker "B" fuel left in her bunkers and some of this fuel started to spill when the double bottom ruptured amidships. A persistent southeasterly wind of 25 mph moved the slick among the islands and on Thursday morning, less than 36 hours after the grounding, patches of oil were reported[1] as far as Forbes Island (fig. 2). Several ships arrived at the scene during the following days to assist in salvaging the vessel and in containing the oil spill.

CHRONICLE

It soon became apparent that despite the efforts to contain the oil, a significant portion of the ship's fuel was escaping from the wreck and threatened Barkley Sound's ecology.

To examine the behaviour of the oil in the sea and to help assess the extent of beach contamination, the Marine Sciences Branch recalled C.S.S. "Vector" from her work area in the Strait of Georgia and despatched her to Barkley Sound on Friday, March 17th. The Biological Station of the Fisheries Research Board at Nanaimo was advised of the "Vector's" cruise and two marine biologists, Dr. D. Quayle (intertidal invertebrae) and Mr. D. Outram (herring spawning) joined the vessel in Victoria.

The "Vector" arrived in Mayne Bay early Saturday morning. At dawn, two boats were launched and began working their way south towards the wreck, examining shores for signs of oil pollution. The "Vector" moved to the wreck site for a brief meeting with Mr. Larry Slaght, the Victoria District Manager of M.O.T., who was conducting salvage and oil containment operations from C.C.G.S. "Camsell".

After the rendezvous with "Camsell", the "Vector" continued her reconnaissance in the general area northwest of the wreck site, taking sea water samples at locations where oil had been reported.

Shore reconnaissance with small boats continued until darkness and was resumed at daybreak Sunday morning, covering the western and northwestern outer islands of the Broken Group.

After a second meeting with Mr. Slaght on CNAV "St. Anthony" (the "Camsell" left the wreck site Saturday afternoon), the "Vector" departed from Barkley Sound and returned to Victoria, Sunday evening, March 19.

The weather had been rather inclement throughout the operation; the winds were southerly at 15 mph, gusting to 35 mph in rain squalls. A moderate swell with an on-shore wind made boat landings on the western shore of Barkley Sound (the shoreline southwest of Forbes Island) too hazardous. Since the "Camsell's" helicopter had earlier reported a slick off this shore, which is one of the main herring spawning grounds in Barkley Sound, arrangements were made with the Fisheries Protection Officer o/b the "Comox Post" to visit this area at a later date.

The "Vector" under Captain C.E. Macaulay was ideally suited for this emergency. Her experienced crew and rugged boats enabled us to cover a large area in a very short time. There were no breakdowns or delays.

DISCUSSION

On the basis of some broad assumptions, we estimated the amount of oil drifting in the general area on the 18th and 19th of March to be about 500 barrels (17,500 Imp. gallons), and on the beaches 150 barrels (5200 Imp. gallons), see fig. 2.

The "broad assumptions" were as follows:

(1) The oil in the immediate vicinity (one square cable) of the wreck had an average thickness of 1mm, decreasing to 1/2mm in the channel north of Austin Island, over an area of 3 square cables. In laboratory experiments[2] the final thickness of oil films on water has been found to vary between 15 and 150 microns. This thickness increases considerably when the water contains surface active agents (also produced by the spreading oil itself) and consequently has a lower surface tension. Moreover, the oil in the immediate vicinity of the "Vanlene" was often trapped by an onshore wind and could not spread freely. Therefore, a layer thickness of 1mm near the vessel and 0.5mm in the channel seemed a reasonable estimate.

(2) The oil observed in the form of iridescent slicks had an average thickness of 2.5×10^{-5}cm over an area of about four square n.m. This assumption was derived from basic optical considerations: A thin film will create an interference pattern for a particular wave length of light about twice the thickness of the film. If visible light has a wave length of about 5×10^{-5}cm, we may expect to see colours when the thickness of the slick is about 2.5×10^{-5}cm (10^{-5} inches).

(3) A total of 12 miles of beaches was covered with a one-foot wide band of oil at an average thickness of 1/2 cm. This estimate was derived from spot checks at various beaches (fig. 2). We concentrated our

attention on the more remote islands and beaches north and west of the wreck site. The site itself was being examined by a large group of Simon Fraser biology students operating from their Bamfield research station. This group was quoted by the press as having seen oil two feet thick in the area, a report which created apprehension among the public but which we were unable to confirm. We learned afterwards that it was based on observations of tidal pools on the eastern shore of Austin Island.(3) Since we did not closely examine the immediate vicinity of the wreck, our total estimate may be somewhat conservative.

Beach contamination is even more difficult to assess than oil on the sea since a moving sand beach might cover the oil. The "Vanlene's" 'Bunker B' oil, which turned from black to brown upon emulsification, was particularly hard to spot on sandy and log-covered beaches. 'Bunker C' fuel ("Arrow", "Irving Whale") is black and much more conspicuous, as a comparison between photographs in the "Arrow" and "Irving Whale" reports(4,5) and figures 6 and 7 of this report demonstrate. These photographs also show the almost negligible beach pollution caused by the "Vanlene" compared to that caused by the "Arrow" and "Irving Whale".

The "Vector" carried out a series of five oceanographic bottle casts to determine whether any oil had dispersed in the water column. One of the deficiencies of this procedure is that the bottles become contaminated by surface oil when lowered. We attempted to deal with this problem by lowering the bottles rapidly and agitating the bottles vigorously before sending the messengers down. To test the validity of this procedure, the first bottle went down to a depth well beyond the suspected maximum depth of contamination (about 40 meters). Had this deep sample contained any oil, the results of the analyses of the entire cast would obviously be doubtful.

The samples were inspected by the Biological Station at Nanaimo. No oil was found in any of the samples.

During our beach reconnaissance we counted six contaminated but otherwise quite mobile birds. Herds of seals did not show any sign of contamination. Preliminary inspection of various beaches by Dr. Quayle and Mr. Outram was reassuring. Barkley Sound is an important herring spawning ground with a peak spawning period around the middle of March.[6] Mr. Outram and Dr. Quayle will report their findings in a separate paper. The area will be re-examined at regular intervals during the next six months.

No detergents or chemicals were used to disperse the oil. Peat moss was kept on hand but not used.

A harbour boom of logs was initially employed but proved ineffective. A much more sophisticated boom of synthetic material arrived on Saturday (fig. 4). The boom, an improved version of the Bennet boom dispatched to the "Irving Whale" in 1970[7] was supposed to corral the leaking oil to a more protected location where it could be collected by slicklickers. Local windshifts made this arrangement impractical; the boom was never severely tested and there was not enough oil to prove the merits of a slicklicker.

It is a relatively little known fact that an oil barrier only works at a certain minimum water depth and maximum current. These conditions can be expressed by a dimensionless parameter, the Froude number F:

We have $$F = \frac{V}{\{(1-S.G.)gD\}^{1/2}}$$, where

V = current in feet per second
S.G.= specific gravity of the oil
g = acceleration of gravity in ft/sec
D = depth of channel in feet

This formula is an approximation of

$$F = \frac{V}{(\frac{\Delta\rho}{\rho} gD)^{\frac{1}{2}}}$$

where $\Delta\rho$ = oil-water density difference in slugs/ft^3 and

ρ = density of the water in slugs/ft^3.

Experiments at the hydraulic laboratory of the National Research Council at Ottawa[(8)] showed that the oil is swept underneath the boom when F exceeds 0.4, no matter how deep the oil boom is, or even if the boom is inclined to the flow. For instance, in certain shallow locations near the "Vanlene", at depths less than ten feet, the oil would be swept underneath by a current of 1.5 knots (assuming that the oil's API gravity was 28, or its S.G. = 0.89).

RECOMMENDATIONS

Our method of collecting subsurface water samples to detect oil in particulate form was unsatisfactory. We must find a way to collect samples which are not contaminated by oil droplets nearer the sea surface. We were aware of this problem and, with the co-operation of a local paint manufacturer, tested oil-repellent coatings which would prevent the oil on or beneath the sea surface from sticking to the sampler. We have not yet found a satisfactory coating. We are still looking at other methods and hope to arrive at a better solution within the next few months.

Unfortunately, we did not have a Clarke Bumpus sampling net as was successfully used by F. Barber and W. Forrester after the grounding of the "Arrow"[9]. However, this sampler has some disadvantages in that it may also become contaminated on its way down to the required depth, even with its door closed. It does not take an in situ sample either and the minimum particle size is restricted by the mesh diameter.

Apart from improving our sampling method, we should look into a better laboratory procedure. Our Branch has no facilities for the determination of the oil particle size. The Biological Station at Nanaimo helped us out, but a more formal arrangement in future more serious emergencies is advisable. This remark may well apply to all other phases of the operation. A great deal of confusion still seems to exist regarding the responsibilities of various scientific and technical groups in the event of an oil spill. The number of vessels and the amount of equipment and manpower sent to the area by government agencies, private companies and volunteer groups were excessive. It was a good exercise for all of us, but a clearer definition of the responsibilities of these groups is needed to effectively cope with a future emergency.

It is also regrettable that our volunteer organizations have not yet been given much guidance and instruction.

CONCLUSION

On the 15th of February, 1923, the British freighter "Tuscan Prince" was wrecked at Austin Island in almost exactly the same position as that of the "Vanlene".[10] The "Tuscan Prince" was en route from San Francisco to Seattle and her estimated position was well south of Cape Flattery, near the position originally given by the "Vanlene's" captain in her distress call. Both ships were at least 40 miles north of their dead-reckoning positions.

They might have been caught in the Davidson current, a variable current, which, under certain conditions, flows north along the Washington coast.[11,12] Combining with a southeast gale and an ebb tide from the Strait of Juan de Fuca, this current can create a considerable northwesterly set as was demonstrated by the disabled American steamer "Nika" during the same storm which grounded the "Tuscan Prince". The burning "Nika" drifted from Cape Flattery to the reefs of Barkley Sound at an average speed of 2 1/2 knots.

Although of minor impact to the ecology, these accidents underline the risk of a tanker route from Valdez to Cherry Point.

Assuming a producing rate of 1,200,000 bbls. per day through the Trans-Alaska Pipeline System, and a tanker size of 120,000 DWT, the Puget Sound demand would amount to 0.22 ships per day. In other words, one tanker loaded with 120,000 tons or 28 million gallons of crude Alaskan oil would enter the Juan de Fuca Strait every five days. Although these vessels would sail under American flag and consequently be maintained under rigid inspection, there will always be the possibility of an accident. Regardless of their established routes well out from the coast of Vancouver Island, they must somewhere enter the Juan de Fuca Strait and this area may be the most vulnerable part of the route, perhaps of the entire operation. An engine

breakdown off Cape Flattery in a northerly set such as experienced by the "Tuscan Prince" and several others could conceivably cause the ship to drift towards the shore near Carmanah Point in four hours, well before the arrival of tug boats or rescue vessels.

The "Vanlene", nearing the end of her voyage, had only 400 tons of fuel left in her bunkers. About 300 tons were spilled and in spite of a great deal of effort and modern equipment, none of the 300 tons spilled was either contained or salvaged.

The supertankers entering the Juan de Fuca Strait would not carry 400 tons, but 120,000 tons of oil.

When witnessing the frustration involved in attempting to control a few hundred tons of oil, one cannot help but have misgivings about the containment of a spilled cargo of a supertanker.

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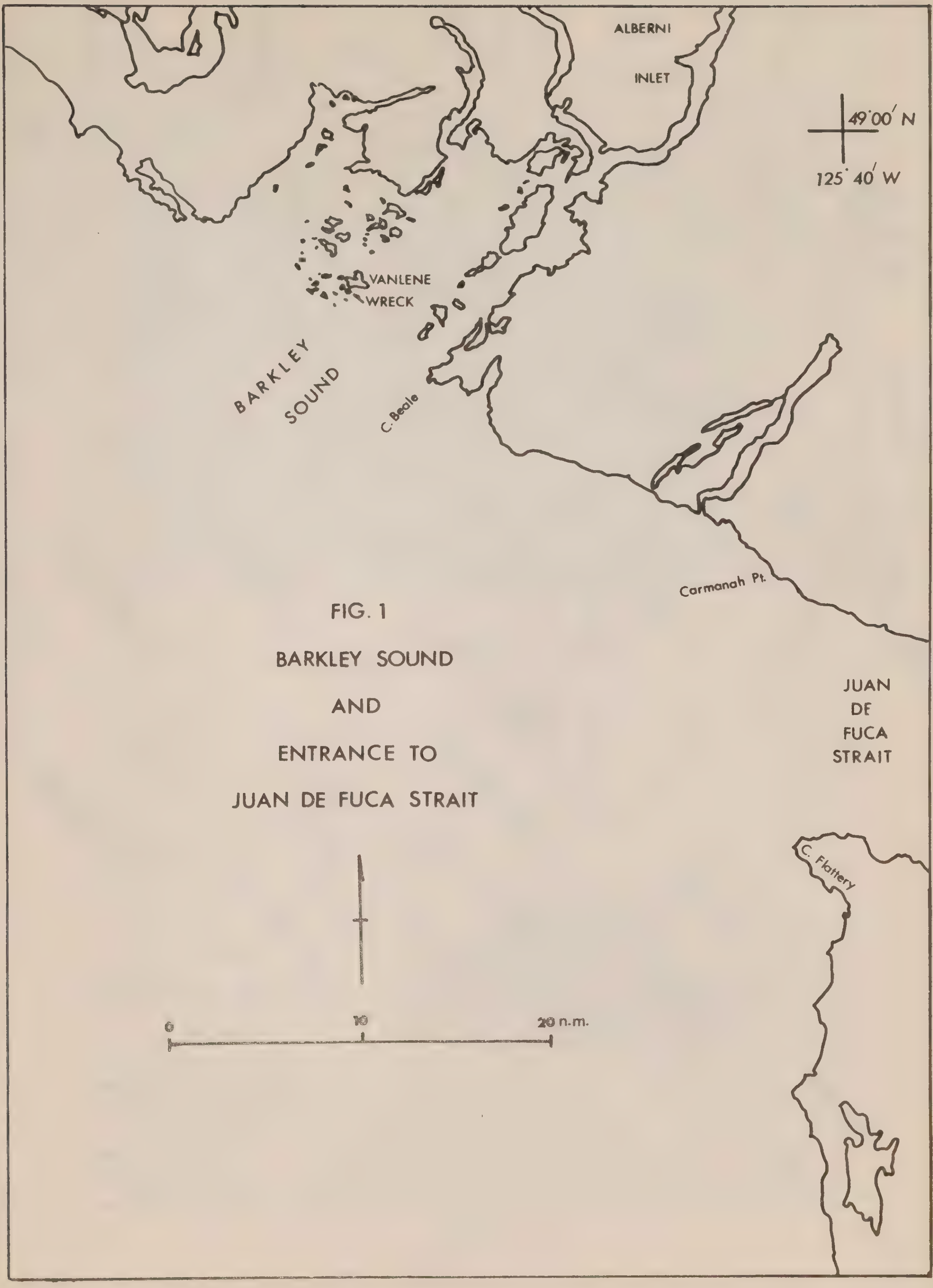

FIG. 1

BARKLEY SOUND

AND

ENTRANCE TO

JUAN DE FUCA STRAIT

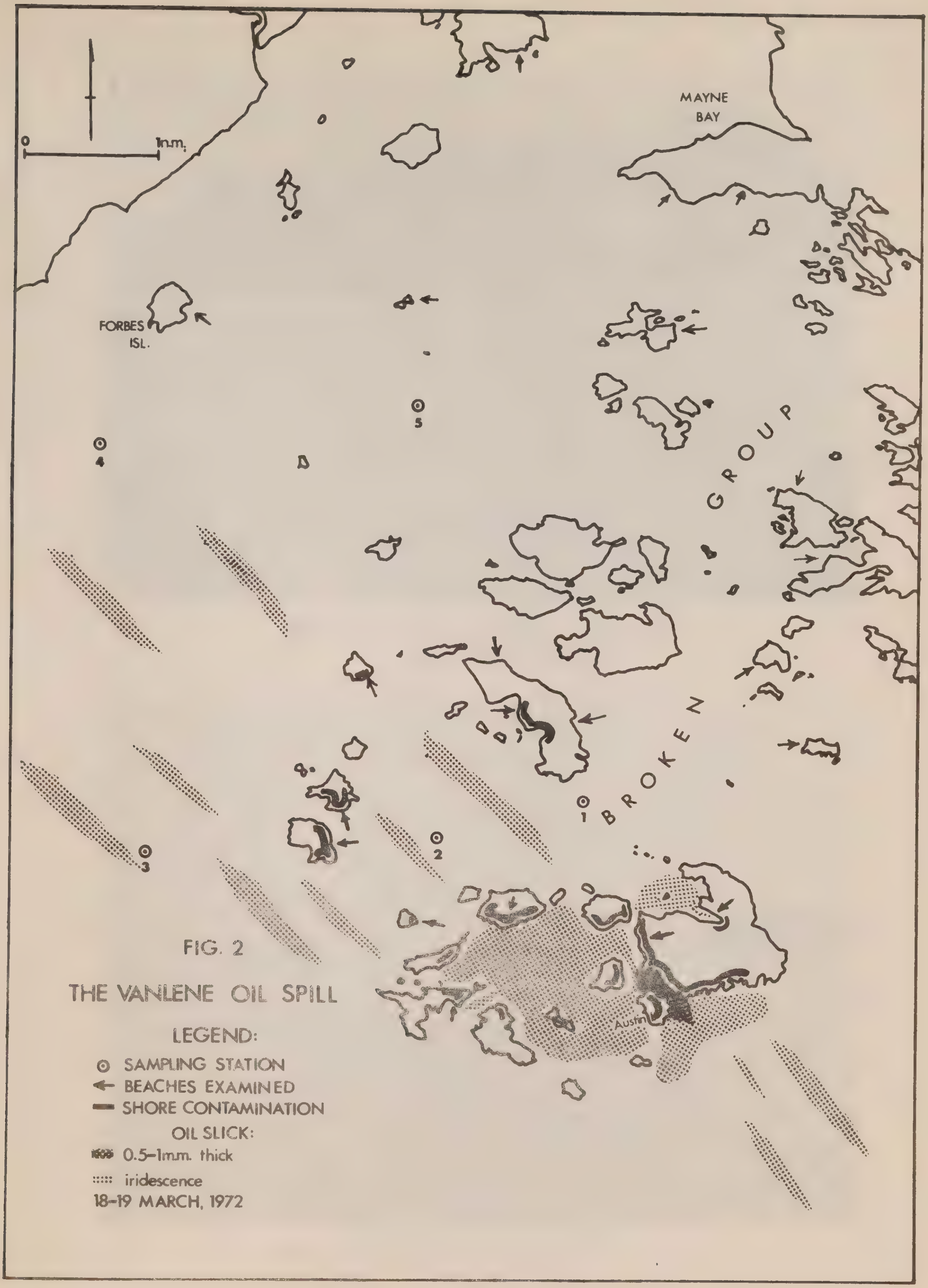

FIG. 2

THE VANLENE OIL SPILL

FIG. 3 THE "VANLENE", THREE DAYS AFTER HER GROUNDING

FIG. 4 THE OIL SLICK

FIG. 5 THE "BENNETT" BOOM WITH
CNAV "ST. ANTHONY", MARCH 18th, 1972

FIG. 6 SLICKLICKER AND "BENNETT"
BOOM AWAITING IMPROVED WEATHER
CONDITIONS, MARCH 18th, 1972

FIG. 7 BEACH POLLUTION: CONTAMINATED ROCK

FIG. 8 BEACH POLLUTION: CONTAMINATED SAND